



Classical 3100

USER'S MANUAL

Operation Manual

for P3700 High Pressure Constant Flow Pump

V1.0.5

ELITEHPLC

Statement

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Please read the document carefully before using P3700 pump.

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 may result in serious injury or damage to health and property. The property damage include the environment around and the instrument.



[Caution] Failure to properly follow the instructions and precautions indicated by this sign may result in slight injury or damage to health and property. Slight injury means no hospitalization is needed to the wounded. Slight property damage means the instrument 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] P3700 pump should only be used as a part of liquid chromatography. Do not use it for any other purpose. Except for special instructions, this 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°C to 30°C 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 (0.45 μ m), and an online filter is also necessary to prevent small particles from scratching plunger rod, seal ring or blocking tubing. 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 tubing.

Before sample test, ensure that the tubing 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 tubing jam, and even system paralysis.

Halogen ions is harmful for stainless steel, if there is stainless steel tubing 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 tubing 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 acceptable.

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

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

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

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. tubing 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.

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Chapter 1 Introduction

1.1 Overview

P3700 high pressure constant flow pump is a new semi-preparative pump with completely independent intellectual property designed by Dalian Elite Analytical Instruments Co., Ltd. A HPLC system include not only constant flow pumps, but also UV-visible detector, injection valve, workstations and etc. In addition to P3700 high-pressure constant flow pumps, Dalian Elite Analytical Instruments Co., Ltd could supply a full range of products and parts of high performance liquid chromatography. For more information about the rest, please refer to the corresponding user manual.

P3700 is a double plungers and parallel reciprocating pump. Subdivision stepping motor control technology is adopted to make the motor run smoothly at low speed. With the installation of floating guide plungers, high quality piston rod and other key components, the P3700 pump could run stably and durably in a long time. Mobile phase compression coefficient correction and flow rate correction result in high accuracy. You can easily control the instruments by workstation. P3700 high pressure constant flow pump is very suitable for semi-preparation in chemical, pharmaceutical and biochemical fields.

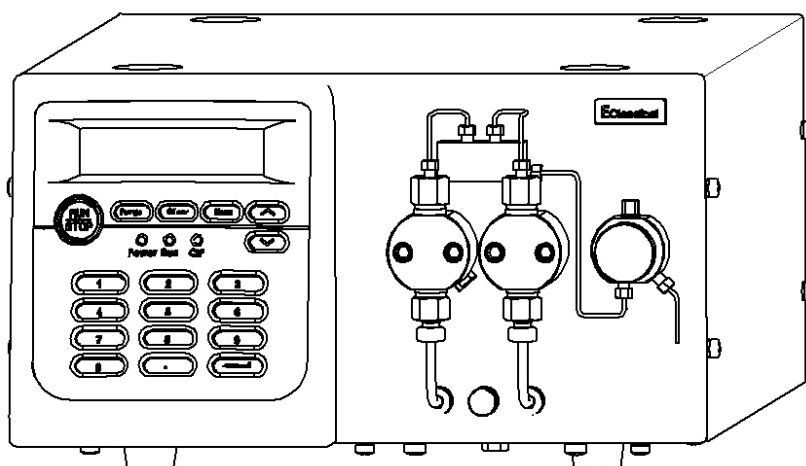


Figure 1-1: P3700 pump

1.2 Features and Functions

- Double plungers and reciprocating constant flow pump with low infusion pulsation.
- Subdivision stepping motor control technology ensures accuracy and stability, even at a low flow rate or binary gradient system. This greatly increases the repeatability of the results.
- Floating guide plungers' installation, high quality piston rod and other key components ensure running stability and durability of the pump in long period.
- $\pm 15\%$ for flow compensation can be achieved by compression coefficient correction and flow rate accuracy correction. Hence accurate and precise flow rate is obtained for different solvent systems.
- P3700 pump can be controlled by workstation with RS-485 interface. Furthermore, two pumps can communicate with each other by other RS-485 interface to achieve accurate and consistent binary gradient flow.
- Real-time pressure display, maximum and minimum pressure warning ensure the security of instrument operation.
- 3 different units for pressure: MPa, psi and bar.
- Purge function can instantly increase the flow rate of mobile phase for flushing purpose (60mL/min).
- Integrated circuit controller AT89C55 and SPI bus technology acquired compact structure
- User-friendly and easy to operate by VFD monitor and silica gel keyboard.

1.3 Performance Specification

Table 1-3: Performance Specification of P3700 pump

Items	Specifications
Flow Rate	0.01-100.0mL/min (Step:0.01mL/min)
Accuracy	±1.5% (30.00mL/min, 8±2MPa, water, ambient temperature)
Precision	≤1% (30.00mL/min, 8±2MPa, water, ambient temperature)
Max Pressure	30MPa (0.01-20.00mL/min) 20MPa (20.01-100.0mL/min)
Pressure accuracy	±3%
Pressure pulsation	≤0.3MPa (30.00mL/min, 6~8MPa, water, ambient temperature)
Leak proofness	Pressure drop ≤3MPa(30MPa, 10min)
Dimension/Weight	420mm×300mm×175mm/16kg
Power Supply	AC 220V±10%,50Hz±1Hz
Power	300W

Chapter 2 Installation and Transport

2.1 Unpacking Inspection and Standard Accessories

P3700 high pressure constant flow pump is packaged with corrugated boxes and foam lined structure. When you receive the instrument, please check the packaging first. If the package 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 Unpacking

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



[Warning] The pump is very heavy, to prevent sliding, at least two persons are suggested for pump installation.

2.1.2 Strengthening bolt removing

To prevent the pump body shift or fall off while transport accidents occur, the reinforcement measures are taken before it is transported. Four M6 × 65 six-party bolts and external tooth lock washer are used to reinforce the pump body and the instrument plate. The location of the four bolts shown in figure 2. Before the first installation, you need to remove the outer six square screws and the outer tooth lock washer, otherwise the pump will produce greater vibration and noise while working.

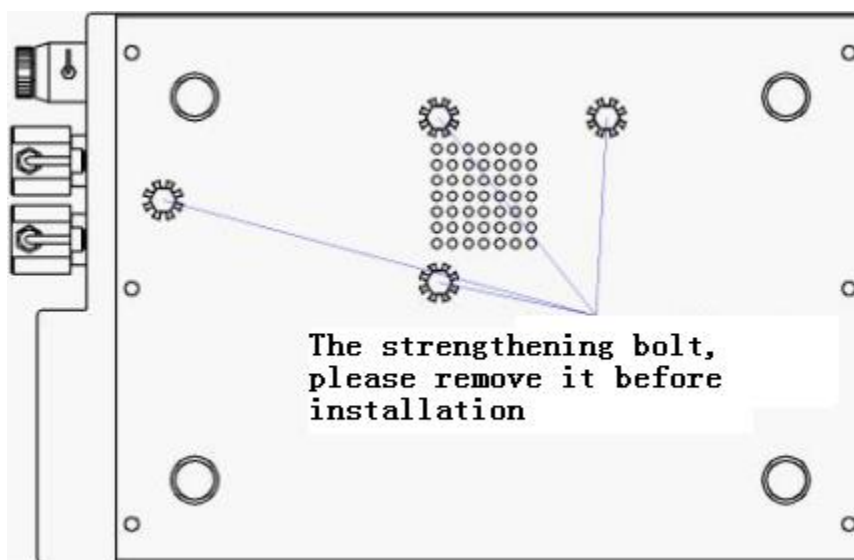


Figure 2-1: The baseplate of P3700 pump



[Note] The Four M6 × 65 six-party bolts and external tooth lock washers removed from the pump should be kept well. Before transport the pump, please make sure the bolts and washers are installed.

Before using P3700 pump, please read the User Manual carefully. If there is any question, please make a contact with Dalian Elite Dalian Elite Analytical Instruments CO., Ltd.



[Warning] The instrument can only be used under the application conditions in the manual. Dalian Elite analytical instruments CO., Ltd. is not responsible for any loss caused by negligence installation or improper operation.

According to international practice, the high pressure constant flow pump is precision instrument, the vulnerable parts, such as the sealing ring, the jewel ball and ball seat in the one-way valve and the stone plunger bar are not in the normal scope of warranty. The maintenance of the relevant parts shall be conducted under the guidance of the customer service personnel. Person without strict professional training shall not disassemble or maintenance without authorization.

2.1.3 Deliver checklist

Before installation, please check the deliver list carefully. If any parts were lacked, please communicate with Dalian Elite Analytical Instruments CO., Ltd. or local dealer as soon as possible.

Table 2-1: Deliver list of P3700 pump

NO.	Items	Quantity
1	P3700 pump	1 pc.
2	Certificate	1 pc.
3	Service Card	1 pc.
4	Start Package	1 pc.
5	P3700 User manual (CD)	1 pc.



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

2.2 Stacking Order

In order to guarantee the best working state of the instrument, it is recommended that the instruments should be stacked as shown in figure 2-2.

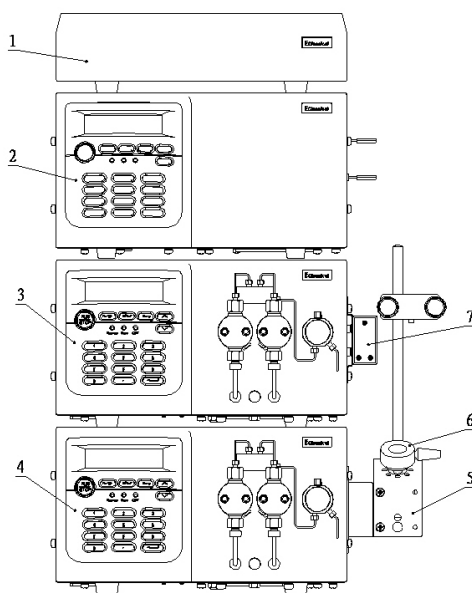


Figure 2-2: EClassical3700 stack order

- 1.Solvent tray, 2.UV-visible detector, 3.Pump A, 4.Pump B,
5.Valve bracket, 6.Injection valve, 7Mixer

2.3 Installation Requirements

2.3.1 Site requirements

Environment

Pump P3700 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, also, good ventilation is important
2	Electromagnetic field	No electromagnetic noise nearby
3	Operating temperature	4~40°C(39~104°F)
4	Humidity	20%~80%, non-condensing
5	Temperature fluctuation	< ± 2°C /hr



[Caution] Do not use the pump in 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 P3700 pump can be put on almost any laboratory bench. Please make sure that the bench has sufficient load bearing capacity, if you want to place the complete 3700 system on the bench. It needs an additional 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 risk of falling!

2.3.2 Power connection

To keep the instrument working normally and safety, please use a dedicated power line within the specified voltage range.

Grounding, AC power to 220V \pm 10%, 50 Hz,

Please choose T1.5 A (250V) fuse.



[Warning] Please use the special power cord provided by ELITE, using other brands or unknown power cord may cause damage to electronic components. 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

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

Operation system requirements

- Windows XP Professional(SP3)、Windows 7 or higher version(Refer to the workstation manual).

2.4 P3700 Front

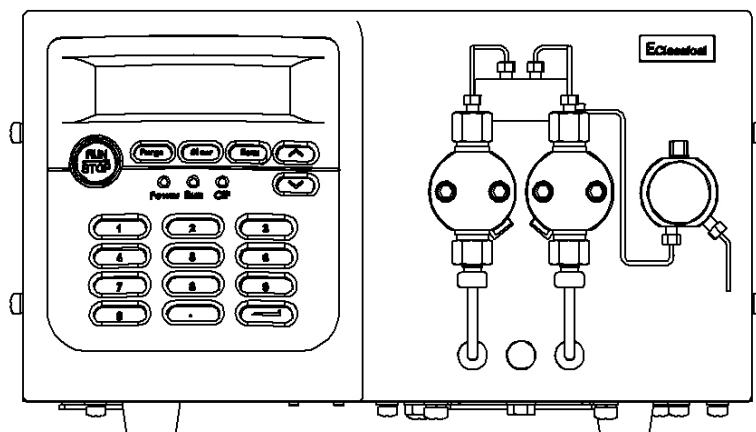


Figure 2-3: Front panel of P3700

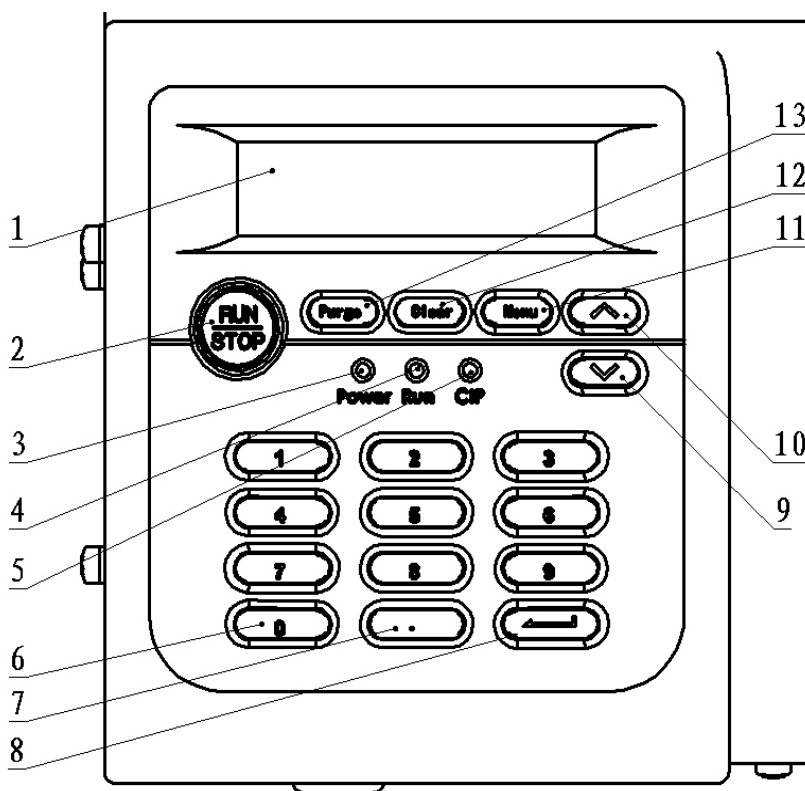


Figure 2-4: Front keys of P3700

Table 2-3: Keypad Function

No.	Key	Function
1	VFD monitor	A display window, to provides the current setting velocity, current system pressureand the limit maximum pressure. The flow rate and the setting maximum pressure can be modified in the state of the main interface. After entering the corresponding data, press the Enter key to confirm.
2	RUN/STOP	To run or stop the pump. Press once, the pump indicator light will be on and the pump will operate according to a pre-set flow rate. Under external control Press the key to pause the pump operation.
3	POWER	Power indicator.
4	RUN	When the run indicator is green, the pump is in run as the setting flow rate. When the pump is purged in a greater flow rate, the indicator is red.
5	CIP	This section is reserved functions. Light is out and the plunger rod will not be cleaned.
6	0 – 9	Numerical keys
7	.	Decimal point
8	ENTER	To confirm values and selections. Upon pressing ENTER key, the cursor will automatically move to the next parameter.
9	↓	Press ↓ key to move between different menu and sub-menu.
10	↑	Press ↑ key to move between different menu and sub-menu.
11	MENU	To access to function menu. Press the MENU key once, to access to the respective MENU1. Press again, to MENU2.
12	CLEAR	To delete input data or to disarm an alarm.
13	PURGE	To flush the pump system at a large flow for P3700. It can be used to purge out trapped air bubbles or change the mobile phase.

The infusion part of P3700 is shown in figure 2-5. The devices and functions are shown in table 2-4.

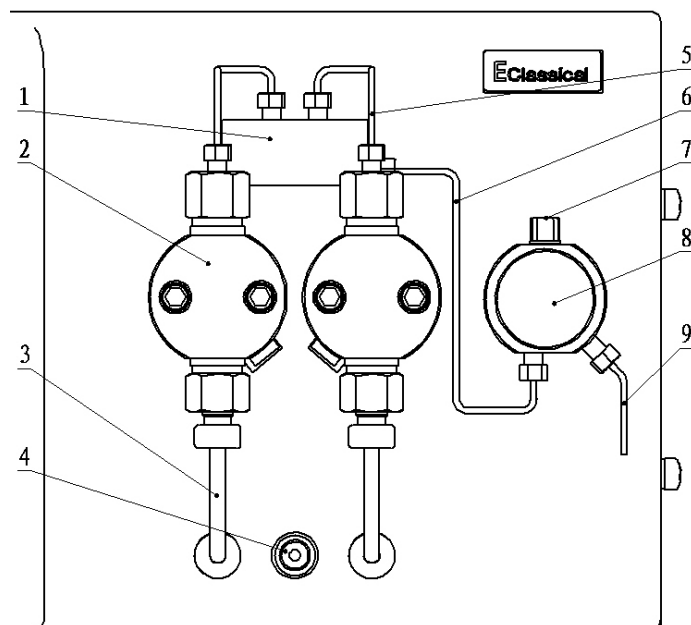


Figure 2-5: The infusion part of P3700

Table 2-4: The infusion part components

No.	Components	Function
1	Outlet tee	To connect connection tubing 2 with connection tubing
2	Pump head	To draw and deliver mobile phase
3	Connection tubing 1	To connect pump head with inlet tee
4	Inlet of the pump	Connect with the mobile phase tubing
5	Connection tubing 2	To connect pump head with outlet tee
6	Connection tubing 3	To connect pump head with relief valve
7	Outlet of the pump	Mobile phase come out from here
8	draw-off valve	Release air and waste liquid
9	waste tubing	Release air and waste liquid from this tubing

2.5 P3700 Rear

The rear panel diagram of P3700 is shown in figure 2-6. The devices and corresponding functions are shown in table 2-5.

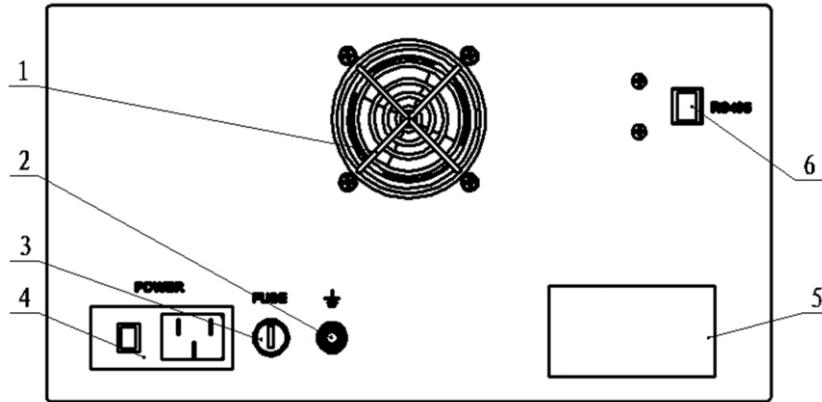


Figure 2-6: P3700 pump rear panel

Table 2-5: Rear panel

No.	Components	Function
1	Cooling fan	For ventilation.
2	Ground terminal	Ground the main body of the pump.
3	Fuse	Fuse is in it. (T 1.5A)
4	Power connector and Power switch	The power cable is connected into grounded power outlet. Turn on / turn off the power.
5	Instrument panels	Identify the information of instrument.
6	RS485 interface	You can connect the pump with detector for remote control from here.

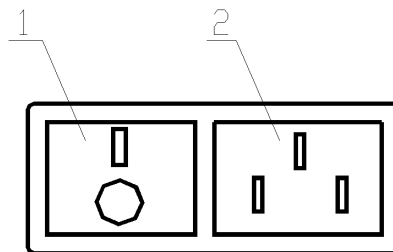


Figure 2-7: Power connector and Power switch

Table 2-6: Power connector and Power switch

No.	Components	Function
1	Power switch	Turn on the / turn off the power.
2	Power connector	Connect the pump with grounded power outlet from here.

2.6 Fluid Connection System

2.6.1 Solvent tubing system diagram

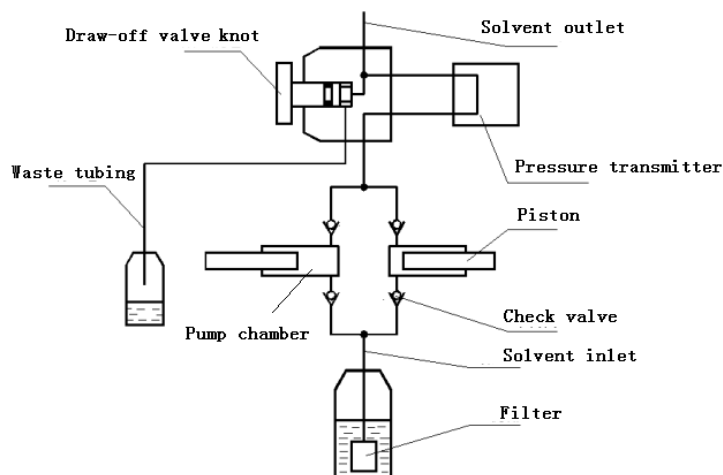


Figure 2-7: Fluid connection diagram

2.6.2 Installation preparations

There should be two 4-5mm holes on the cap of a proper solvent reservoir. Remove the outlet seal plug that is above the exhaust valve. Connect the stainless steel tubing (O.D.1/16"× I.D.0.04") to the draw-off valve and the other end of the tubing will be connected to injection valve.

2.6.3 Connecting solvent reservoir to the pump

Attach the solvent filter to one end of the solvent tubing and put it inside the solvent reservoir. The other end of tubing should pass through the hole in the cap and then connected with the inlet of the pump. You can refer to figure 2-5 and 2-4.



[Note] In addition to the holes for infusion tubing, there should also be a vent hole in the cap to avoid the negative pressure in the reservoir during infusion.

Wash solvent filter frequently to prevent contamination.

To ensure a good performance, the mobile phase should be degassed before using, especially in summer.

The mobile phase should be filtered with at least 0.45μm filter membrane.

2.6.4 Connecting injection valve to the pump

Connect the outlet of the pump to the inlet of injection valve (No. 2 hole is usually the inlet for the mobile phase) with stainless steel tubing (with screw connection and sealing edge ring).

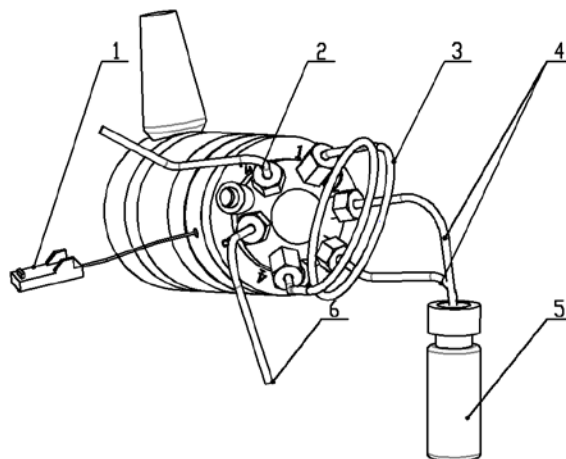


Figure 2-8: Fluid connection of manual filling valve

1. Automatic trigger interface; 2. Mobile phase entrance; 3. Quantitative loop;
4. Waste tubing; 5. Waste bottle; 6. Mobile phase export



[Note] Port #2 of injection valve should be connected to the outlet of pump.

Port #3 of injection valve should be connected to the entry of column.

Do not over tighten the connecting screw, as it may damage the ferrule.

If there is leakage, please replace the ferrule.

To reduce the column efficiency loss, the tubing length between the injection valve and the column, between the column outlet and the detector inlet should be as short as possible, and the ID of connection tubing should be proper.

Make sure the end of all the stainless steel tubing is smooth to reduce dead volume of the system (It is recommended that you'd better choose the universal column connector to connect column inlet and the outlet, the connector is available from Dalian Elite).

2.6.5 Connecting the pump to the mixer

A mixer is required when the pump is used in gradient system. The mixer ensures the mobile phases came from different pumps be mixed well before entering HPLC systems. It is placed besides the P3700 pump. The outlet of pumps are connected to the inlets of mixer respectively, and the outlet of mixers is connected to port #2 of the injection valve.

You can choose different mixer (Mix volume: 1.5mL, 2.5mL and 3.0mL) according to the analysis. The larger volume, the better mix performance and the longer lag time in gradient system.

2.6.6 Solvent waste bottle

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

2.7 System Composition

The following are two HPLC systems composed by P3700 pumps.

2.7.1 Isocratic system

Isocratic system is a relatively simple system, shown as figure 2-10. It can meet the requirement of analysis when the mobile phase is invariant. The configuration is listed in table 2-7.

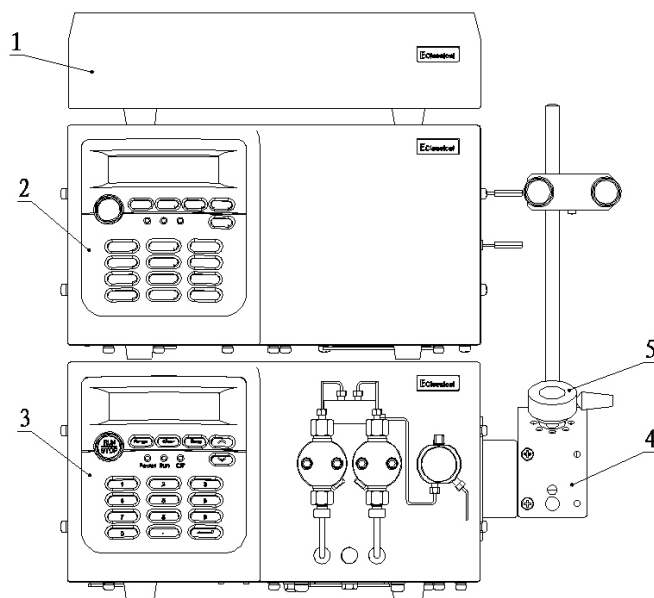


Figure 2-10: P3700 isocratic system

Table 2-7: The configuration of isocratic system

No.	Components	Function
1	TP3100 solvent tray	Used for placing solvent bottles.
2	UV3100 UV-visible detector	Detect the signal and control the other instruments.
3	P3700 pump	Transport the mobile phase
4	Valve bracket	Used for fixed injection valve.
5	Injection valve	Used for injecting the sample into the chromatographic system.

2.7.2 Gradient system

The binary high-pressure gradient system is controlled by chromatography workstation, as shown in figure 2-11. It can realize that the composition of the mobile phase changing while analysis. The system can analyze complicated samples such as proteins, peptides, medicines and so on. The configuration is list in table 2-8.

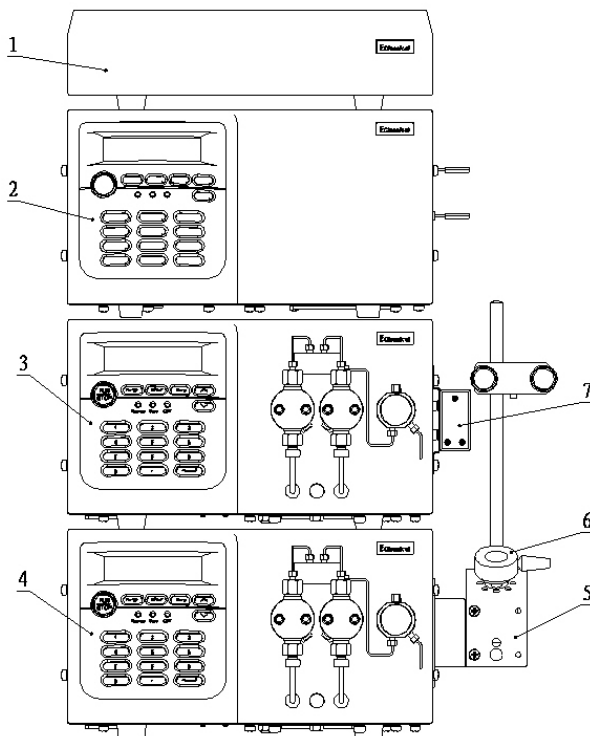


Figure 2-11: P3700 gradient system

Table 2-8: The configuration of gradient system

No.	Components	Function
1	TP3100 solvent tray	Used for placing solvent bottles.
2	UV3100 UV-visible detector	Detect the signal and control the other instruments
3	P3700 pump A	Transport the mobile phase A
4	P3700 pump B	Transport the mobile phase B
5	Valve bracket	For fixed manual sampling valve and mixer (optional)
6	Mixer	Mix mobile phase A and B
7	Injection valve	Used for injecting the sample into the chromatographic system



[Caution] Isocratic system or gradient system can be chosen according to the need.

All the instrument should grounded well.

The power socket for the pump should have grounding terminal.

In order to prevent the device charged and guarantee the stability of equipment operation, the best way is embedded outdoor ground (earth resistance is less than 2 ~ 3 Ω).

2.8 Verification

In normal instance, the instrument has been tested and came with verification the performance met our requirements in factory. User test and verify is not necessary. If you have any doubt about the performance of it, verify it refer to the following steps:

Check the sealing performance

- 1) Connect the chromatographic column properly, then, start the pump and observe whether the pressure displayed is stable. If not, please clean check valve or relief bubble in pump head.
- 2) Set the max alarm pressure to 30MPa. Close the outlet of the injection valve. For the valves that the infusion tubing cannot be closed, you can connect the outlet of it to a two-way, then seal the other end of the two-way.
- 3) When start the pump, the pressure will slowly up to 30MPa, and it will stop automatically. Observe the pressure drop on the screen.
- 4) If the pressure drops less than 3MPa in 10min, sealing of the pump is qualified.
- 5) If the pressure drops more than 3MPa in 10min, many factors should be considered, such as seals lax of check valve, sampling valve or piping joint, or air bubbles in the pump head.

Isocratic system

- 1) Take a chromatographic column.
- 2) Prepare mobile phase and samples according to evaluation report provided by the column manufacturer.
- 3) Empty air bubbles in system. When the system is stable, detect the signal according to the testing requirement.
- 4) If the result and column efficiency is confirmed to the information provide by column manufacturer within the error range, that means the HPLC is qualified.

Gradient system

In addition to the sealing performance of each pump and the repeatability of the sample analysis, the gradient system should also run the gradient curve to test the gradient performance of the system.

1. The method for testing sealing performance of each pump is the same as the section “Check the sealing performance”.

2. Testing the gradient performance.

- 1) Prepare two bottles(volume not less than 500mL) and labeled A and B.
- 2) Bottle A is filled with purity water, ultrasonic degassing is needed.
- 3) Bottle B is filled with purity water, add 0.5mL acetone, ultrasonic degassing is also needed.
- 4) Connect the outlet of mixer and inlet of detector with a stainless steel tubing(OD1/16 " ~ ID0.04 " ,250mm in length).
- 5) Set the detection wavelength to 254nm.
- 6) Set the total flow rate to 30.0mL/min, 50% for each pump, flush until the baseline is stable.
- 7) Set gradient parameters according to table 2-9.

3. Start to collect analysis data and save the chromatogram.

4. Check whether the curve of each step is approximately perpendicular to the change, otherwise the gradient mixing is not ideal.

Table 2-9 Setting the gradient curve in workstation

NO.	Time(min)	Flow rate (mL)	Pump A%	Pump B%	Gradient curve
1	0	30.00	100	0	0
2	2	30.00	80	20	0
3	4	30.00	60	40	0
4	6	30.00	40	60	0
5	8	30.00	20	80	0
6	10	30.00	0	100	0
7	12	30.00	100	0	0



[Warning] Before operating gradient curve, running pump A and B (50% of the total flow rate each) for 10 minutes, and then running A pump 100% of the total flow rate for 10 minutes to ensure that the mobile phase in pump A and B has been fully replaced.

For high pressure gradient control parameters, please refer to the operation manual of workstation. Because the P3700 high pressure constant flow pump is designed for semi-preparation, the analysis result may be slightly different from that of the special analysis pump.

2.9 Transportation

High pressure constant flow pump is a precision instrument, please be careful while long-distance transportation. Severe vibration and drops are likely to cause damage to the internal parts of the instrument. The 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 RS-485 line.

Remove the connecting tubing and other elements between components.

Remove the pump from chromatography system. Put it on a large platform. Install the six-party bolts and external tooth lock washer to instrument plate, the installation position is shown in figure 2-1.

Put the pump into a special sealed bag.

Put the pump into the original packaging foam and fix it.

Place the fixed pump and other accessories into original packaging carefully.

Tape the box sealed to prevent liquid from entering. Covering 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 Basic Operation

3.1 Power On

- Plug the power cord into the power outlet. The power switch should be turned off at this time (“I” means power on, “O” means power off).
- Turn on the power switch.
- Power indicator lights, display screen is bright and P3700 pump begins to self-test. The VFD display sequence is as follows:

```

E C l a s s i c a l   P 3 7 0 0
V e r   1 . 0 0
    
```

After passing self-inspection, the following information will occur on the display screen, you can set or modify the parameters in this state, and then start analysis.

The following is working interface of P3700(the main interface).

```

F l o w       1 0 . 0 0       m L / m i n
P   1 0 . 0   M P a   P m a x   3 0 . 0
    
```



[Caution] The first time you powered on the pump, parameters displayed on the main interface are the default parameters. Otherwise, all parameters of the pump is maintained the previous parameters before last shutdown.



[Caution] The default parameters of P3700pump are list as follows:

Flow: 1.000mL/min;

Pmax: 10.0MPa;

Pmin: 0MPa;

Pressure unit: MPa.

3.2 Menu 1: Basic Operation

In the main interface, you can modify the maximum alarm pressure and the flow rate. If you want to modify a parameter, press the "←" enter key first, and then press "↑, ↓" key to move the cursor to the parameter which going to be modified. After enter the new parameter value, press "←" button to confirm. Then, press "Run / Stop" button directly, the pump will run according to the new parameter. If you want to stop the pump, press the "Run / Stop" button again.

If the setting value of a flow rate is greater than the limit range, the pump will alarm after confirmation and come back to the value before the modification. Press the "Menu" button once to enter "MENU-1 Basic Operation" functional state. You can move into the setting interface of the flow rate, the maximum limit of the pump pressure, the minimum pressure by "↑, ↓" key and modify them in the corresponding interface. Then, you can type a new value directly when the cursor is flashing on the parameter you want to modify. Press "←" button to confirm.

F l o w : 1 0 . 0 0 m L / m i n



[Caution] Flow rate range: 0.01-100.0mL/min

P m a x : 2 0 . 0 M P a



[Caution] Pmax: ≤30MPa (flow rate: 0.01-20.00mL/min) Pmax: ≤20MPa (flow rate: 20.01-100.0mL/min)

P m i n : 0 . 0 M P a



[Caution] The work pressure of the pump is real-time detection. If the pressure less than Pmin or reaches Pmax, the pump will send an alarm signal and stop working. For all parameters, if the setting parameters beyond the scope, P3700 pump will not accept it and continue to maintain the original ones.

After modifying the parameters in MENU-1, press "Menu" again to enter MENU-2. Press the "Menu" twice to return to the main screen.

S	e	a	l	W	a	s	h	i	n	g	:	O	f	f
1	.	O	f	2	.	O	n	1	3	.	O	n	2	?



[Caution] The input number of the plunger rod washing menu indicate:

1(Light is out): stop to clean the plunger rod,

2(Light is green): clean the plunger rod continually,

3(Light is yellow): clean the plunger rod intermittently.

There is no plunger rod washing function in P3700 pump, this part is reserved.

3.3 Advanced Operation

From the main interface, press MENU button to access **MENU-2 Advanced Operation**. Use ↑ and ↓ to access the setting interface of various parameters in MENU2, including the coefficient of the mobile phase, the velocity correction factor, A/B pump assigning and pressure unit. By enter a new value directly when the cursor is flashing to modify the parameters. Then press "←" button to confirm.

M E N U 2 A d v a n c e d O p e r a t i o n
--

3.3.1 Setting pump A/B in gradient system

P3700 pumps can be controlled from the front panel, you can also control them by our workstation software. Further gradient analysis, flow time program analysis and other functions can be found in the workstation too, it can meet the requirements of users in the field of production and research.

The setting of A/B pump can be changed in “MENU2 Advanced Operation”. Press "↑/↓" button to enter A/B pump select interface. Set it before analysis. The cursor flash at where can be modified. Enter the according number, then press “←” button to confirm.

N u m b e r : P - A 1 . P - A . 2 . P - B . ?
--

3.3.2 Flow compressibility

Different solvents exhibit different compressibility characteristics and the compressibility of the same solvents may be different when the pressure change. The compressibility of the solvents in use will affect flow rate of mobile phase. In order to minimize this effect, the P3700 provides a compressibility compensation feature which optimizes the flow stability according to the solvent type.

The flow compressibility is set to a default value of 100% (using degassed distilled water as mobile phase) and can be changed through the user interface.

Measurement of the flow compressibility

Equipment: A measured 500mL volumetric flask, stopwatch, degassed solvent.

Procedure:

- (a) Disconnect the column and eliminate the backpressure of the system to zero.
- (b) Select a proper flow rate according to the analysis method. Press the “RUN/STOP” key to start the pump.
- (c) Start the stopwatch and begin to collect the mobile phase from the pump in the 500mL volumetric flask.
- (d) Record the time it takes to reach 500mL, t_1 .
- (e) Repeat step (b) to (d) three times to get the average, t_1 .
- (f) Stop the pump and reconnect the column. Then repeat step (b) to (e). Calculate the time with column attached to the system, t_2 .

$$\text{Relative error} = (t_2 - t_1) / t_2 \times 100\%$$

If the relative error is allowable, you have no need to change the compression coefficient. If the error is obvious, adjust the compression coefficient following the steps below.

Adjusting the compressibility parameter

Enter the “MENU2 Advanced Operation” to adjust the compressibility parameter, input a new compressibility parameter and press “←” to confirm.

C o m p . F l o w : 1 0 0 %



[Caution] The range of the flow compressibility is 85 - 115%. If the entered flow compressibility value exceeds the range, the cursor will blink and the value will return to 100%.

3.3.3 Flow correction

Several factors will affect the accuracy of flow rate: the state of block filter and on-line filter, dirty check valve, the combination of plunger rod and seal ring etc. P3700 pumps are designed with the function of flow correction.

The method of the flow accuracy correction is the same as the flow compressibility measuring. If the flow accuracy is beyond the permitted standard, you should adjust the calibration parameter as below:

Enter the “MENU2 Advanced Operation”, press “↑、↓”button to get into the flow correction interface. Then input a calibrated parameter and press “←” to conform.

C a l i b r a t e : 1 0 0 %



[Caution] The range of the flow correction is 85 - 115%. If the entered flow correction value exceeds the range, the cursor will blink and the value will return to the previous one.

The accuracy of flow rate may be affected by the block filter, on-line filter, tubing and esc. Please check them carefully before adjusting the flow correction coefficient.

It is necessary to ensure that the accuracy test method is reliable, or the modification of flow correction coefficient may cause a large deviation of the analysis result.

3.3.4 Pressure unit

P3700 pump can display pressure in three different units: MPa, bar and psi.

$$1 \text{ MPa} = 10^6 \text{ Pa} = 10 \text{ bar} = 145.04 \text{ psi}$$

Enter the “MENU2 Advanced Operation”, press “↑、↓”button to get into unit interface. Then chose the unit you need and press “←” to conform.

P r e s s u r e U n i t : M P a
1 . M P a 2 . b a r 3 . p s i ?



[Caution] Select “1” for MPa, “2” for bar and “3” for psi.

3.4 Mobile Phase Replacement

There are various liquids used in HPLC as mobile phase, including organic solvents, water, buffers, etc. Intermiscibility and buffer salting out are important problems should be considered. Please take care when you need to replace mobile phase. If necessary, you can refer to the corresponding physical chemistry handbook.

3.4.1 Replacing with miscible liquid

E.g. replacing methanol with acetonitrile

- 1) Store acetonitrile in a clean solvent bottle.
- 2) Take the filter components out from methanol reservoir, wash it with acetonitrile, then, put it into acetonitrile.
- 3) Open the draw-off valve. Flush the pump with approximately 100mL of the new mobile phase.
- 4) Close the relieve valve, disconnect the column from the system, then, put a bottle at the outlet of the inject valve.
- 5) Turn on the pump and pump the new mobile phase out about 20 mL.
- 6) Reconnect the column. Turn on the pump at a suitable flow rate. The system need to equilibrate for at least 30 minutes.

3.4.2 Replacing with immiscible liquid

E.g. replacing methanol with n-hexane

Choose an intermediate washing liquid about 50 mL, which must be miscible with both the new and old mobile phase. In the above example, iso-propanol can be used as the intermediate washing liquid, because iso-propanol is miscible with both methanol and n-hexane.

Follow the procedures as described in section 3.4.1 using the intermediate washing liquid to replace old one.

Repeat the procedures as described in section 3.4.1 using the new mobile phase to replace intermediate washing liquid.

3.4.3 Replacing organic solvent with salt buffer

Crystalline salt may appear when buffer salts mix with an organic solvent. Crystalline salt is harmful to the seals, the plunger rod, the injection valve and the internal rotor and stator, moreover, it may block the tubing. So, please transition the system with a certain proportion of water-containing organic solvent before analysis. After the experiment is finished, do transition the system again with the same method above, and save the column with organic solvent.

Chapter 4 Maintenance and Repair

4.1 Troubleshooting

Troubleshooting a pump can be frustrating and sometimes a mysterious process. This section outlines a common sense process for troubleshooting a pump. If troubles can not be solved when referring to this section, please contact Dalian Elite post-sales service or local distributor.

4.1.1 Air bubbles in eluent lines

Air bubbles are likely to be trapped in pumps under the following circumstances: the initial use of pump, the pump has been left idle for some time, improperly degassed mobile phase etc. It is crucial to remove these trapped air bubbles. Otherwise, they affect system operation in a number of ways, such as pressure fluctuation, flow rate instability, and column damage.

How to remove trapped air bubbles

Open the draw-off valve and press “PURGE” key, flush with high flow rate to remove air bubbles in pump head and inlet lines.

If the pump is unable to draw mobile phase after PURGE key was pressed, use a syringe to withdraw mobile phase from outlet of draw-off valve until the liquid flows out.

If the pump is still unable to withdraw mobile phase, it is probably caused by the dirty check valve. Follow related content in maintenance manual to clean the check valve.

4.1.2 Pump head leakage

Pump head leakage is a common problem, mainly caused by seal or piston damage in the pump head. Therefore, when the pump leakage occurs, replace worn parts in time.

4.1.3 Overpressure

During P3700 is running, real-time pressure monitoring system works. When the pressure exceeds the high-pressure limit, P3700 pump will automatically stop and alarm. Open the draw-off valve to release the system pressure is a good choice at this time. Then reset the pressure limit, or check the entire fluid path to look for the reason of the surplus pressure.



[Caution] Setting maximum pressure should be lower than the maximum pressure the column can withstand, or the column may be damaged.

4.1.4 Pump not delivering solvent

Pump not delivering solvent is usually caused by air bubbles in pump head or blocking in solvent filter. In general, the problem can be solved by remove air bubbles or cleaning inlet solvent filters. But a dirty check valve can also cause the problem. So if the pump does not suck liquid after exhausting air and cleaning solvent filter suite, please clean the check valve. Refer to the related contents in the user manual for check valve cleaning. Common failures and solutions are shown in table 4-1.

Table 4-1: A summary of most common problems affecting system operation

Symptoms	Cause	Solutions
Erratic flow rate and pump pulsations	Air bubbles in pump head	1.Removing air bubbles through the draw-off valve. 2.Withdraw air bubbles with a syringe through the draw-off valve.
	The old solvent remained in the pump cavity	Increase the flow rate to displace old solvent through the draw-off valve.
	Air bubbles in the solvent filter and the inlet tubing	1.Vibrate the solvent filter to remove air bubbles. 2.If the solvent filters are dirty, clean them with ultrasonic cleaner or replace solvent filters. 3. Degas the mobile phase.
	Check valves malfunctions	Clean or change the check valve.
	Leakage from Piston or seal	1.Replace piston rod and seal. 2.Change the faulted part.
	Tubing leakage	1.Tighten the loose screws. 2.Replace the failure parts.
	Tubing blockage	Clean or replace the tubing.
Pump running without eluent out	Air bubbles in the pump cavity	1.Remove air bubbles through the draw-off valve. 2.Withdraw air bubbles with a syringe through the draw-off valve.
	Air bubbles entering from the inlet into the pump head	Tighten the cap of the pump head.
	Air in the pump head	Perfuse fluid in pump head, open the draw-off valve and turn on the pump to the maximum flow rate until no air bubbles appear.
	Incorrect check valve installation direction	Install the check valve correctly.
	Glued or worn ball and seat of the check valve	Clean or replace the check valve.
	Eluent reservoir empty	Fill reservoir.

Symptoms	Cause	Solutions
The actual flow rate is lower than the set value	Check valves malfunctions	Clean or replace the check valve.
	Dirty solvent inlet filter	Clean or replace the filter.
No liquid delivering (pump does not run)	Power switch is off	Switch on.
	Pump not connected to power	Connect power cable.
Flow rate decreases when the pump is running	Air bubbles gathering in the pump	Open the draw-off valve, set to high flow rate to remove air bubbles.
	Solvent inlet filters plugged	Open the cap of the pump head. If there is no liquid out from eluent tubing immediately, it means solvent filter is plugged. Please clean or replace the filter.
	Immiscible eluents in the pump	Dissolve Immiscible solvents by transition solvent.
	Plunger seal leakage	Check and replace the piston and seal.
	Compression compensation failure	Check or replace the pressure converting board or pressure transmitter.
Flow rate is too high	The flow rate compensation failure	Check or replace it (see instructions).
	P.C. board malfunctions	Replace the P.C. board.
	Compression compensation failure	Check or replace it.
High pressure	Tubing blockage	Screening each section of tubing to find blocked part. Replace or cut off the blocked tubing.
	Tubing I.D. too small	Use correct tubing.
	Online filter blockage	Clean or replace filter sieve.
	Column blockage	Replace the chromatographic column.
No/Low pressure	Eluent reservoir empty	Refill reservoir.
	Loose draw-off valve	Tighten the draw-off valve.
	Pump pressure transmitter malfunctions	Check or replace the pressure transmitter.
	Tubing joint leakage	1.Tighten the loose screw or ferrule. 2.Replace the worn parts.
	Seal leakage	Clean or replace the seal.
	Both the inlet and outlet of the pump have air bubbles	Open the draw-off valve, set to high flow rate to remove air bubbles.
The pump has a humming sound and can not start properly	The motor failure	Stop the pump and check it.
	Phase voltage is too low	Increase phase voltage.

Symptoms	Cause	Solutions
Pump not sucking eluent	Air bubbles in pump head	Remove the air (refer to the above item).
	The inlet check valve plugged	Check and replace it.
	The outlet check valve plugged	Check and replace it.
	check valve installation direction reversed	Install the check valve in the correct direction.
The pump stops in operation.	Pressure is higher beyond the limit	a) Reset the maximum pressure limit. b) Replace the column. c) Replace tubing of correct I.D..
	Power cut	a) Check the power supply. b) Shut off the main power supply, and check the fuse.
Column pressure indicated, but no eluent flowing from the detector	Serious leakage in the system	Repair tubing and fasteners from column outlet to the detector.
	Fluid path blockage	Clean injection valve or the connection between the column and detector or particles in flow cell.
	The column inlet blocked by particles	Clean or replace the column inlet filter sieve, or replace the column. Filter mobile phase and samples properly.
The column pressure increases, but the flow rate decreases.	Column or guard column is partly blocked	Clean or replace the column inlet filter, or replace the column.
	The inlet tubing of the detector is partly plugged	Unload and clean the flow cell and tubing.

4.2 Maintenance and Repair

In order to ensure the normal operation of the high pressure constant flow pump, maintenance and repair are important. Maintenance means simple repair. Such repairs can be proceeded from the front panel of the pump. There is no need to take out the pump from the stacked configuration. And repair is mainly referred to those operations which need to change the internal parts and remove the pump body from the stacked configuration and disassemble.

4.2.1 Maintenance of solvent inlet filters

Dirty reservoir and mobile phase contamination are likely to cause blockage to solvent inlet filter. Also, using buffer for a long time may lead to filter pollution and flow impassability. The blockage, pollution and impassability will affect pump operation. Recommended practices can extend the service life of the filter and guarantee the normal work of the pump. Replacing colorless reservoir with brown reservoir is an effective way to prevent fungi biological from growing.

- Filter all solvents through a 0.45 micron (or smaller) filter membrane.
- The aqueous mobile phase needs to be replaced or filtered often.
- If it is allowed, you can add 0.0001 to 0.001 mole of sodium azide in the mobile phase to prevent the growth of fungi

When the solvent filter is blocked seriously, air bubbles will appear in infusion tubing even if the mobile phase was degassed. Please clean the solvent filter at this time. Cleaning steps are as follows.

- 1) Remove the solvent filter from the bottle-head assembly and immerse it in a beaker with 30% nitric acid (v/v). Sonicate for 15 minutes.
- 2) Sonicate the solvent filter in distilled water for 10 minutes.
- 3) Blow-dries the filter.
- 4) Sonicate the solvent filter again in distilled water for 10 minutes.
- 5) Blow-dries the filter again.
- 6) Reassemble the solvent filter, and put it into mobile phase reservoir.

4.2.2 Cleaning the check valve

Pump outlet and inlet are equipped with check valves. The components are the same, so a check valve component can be used for any end of the pump. The appearance of the check valve is shown in figure 4-1.



Figure 4-1: Appearance of the check valve

Usually, it is not necessary to clean check valves. If sediment occurs in valve or valve ball and seat are adhesive, cleaning should be carried out.

Overall cleaning:

When the check valve has been assembled completely, overall cleaning can reduce the adhesion condition.

- 1) Take out the check valve at the pump inlet: remove infusion tubing from the inlet housing, unload inlet check housing using a wrench and take the check valve components out.
- 2) Take out the check valve at the pump outlet: remove infusion tubing above pump head with a wrench, then unload the outlet check housing and take the components out.
- 3) Immerse them into ethanol and sonicate them twice (15 min each time). Then blow off the solvent inside.
- 4) Assemble the cleaned check valve properly while pay attention to the direction of the check valve.



[Caution] Pay special attention to the installation direction of the check valve. The ring mark of the check valve should be located in the fluid inlet.

If overall cleaning can not solve the problem, deep cleaning becomes necessary. Cleaning steps are as follows.

Deep cleaning:

- 1) Unload the check housing with a wrench. Take the check valve out.
- 2) Insert wallpaper knife into the gap between the retainer and retainer seal. Take the valve ball, seat and guide seal components out carefully. Put them into ethanol and clean with ultrasonic.
- 3) Observe the valve ball and seat with magnifying glass. If the valve ball or seat is damaged, please change a new one.
- 4) Assemble the cleaned check valve referring to figure 4-2. Roughness of different sides of the valve seat is not the same. Identify them carefully before installation (the gem ball seats the smooth side).
- 5) Blowing is a good method to check the correction of the installation. Use an auralave to blow the check valve from the inlet having a ring mark near by. You can feel airflow at the other side. Otherwise, air can not pass through.



[Caution]It is suggested to use a small container during cleaning to avoid the loss of the valve components.

Each group of the valve ball and seat is grinded in pairs, therefore the components cannot mix between different valves.

The system should be flushed with methanol and deionized water successively if the pump will be idle for more than a month, in case of adhesion between ball and seat.

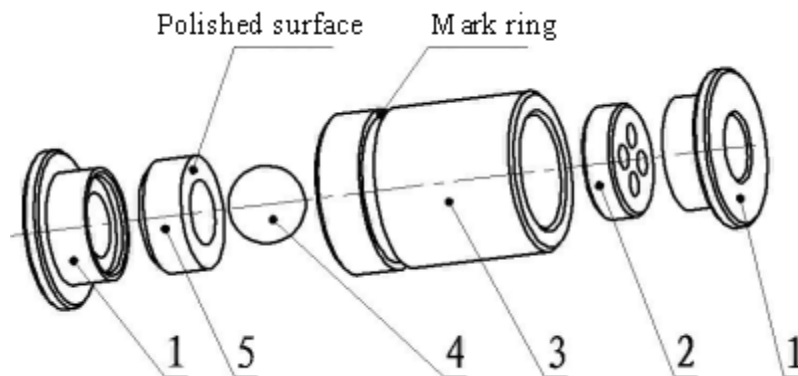


Figure 4-2: Assembly of the inlet check valve

1.Retainer seal, 2.Hole pad, 3.The marked retainer, 4.Valve ball, 5.Valve seat

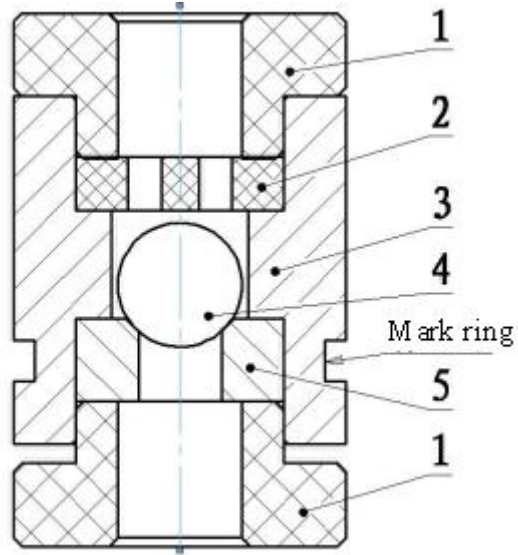


Figure 4-3: Cross-section of the inlet check valve

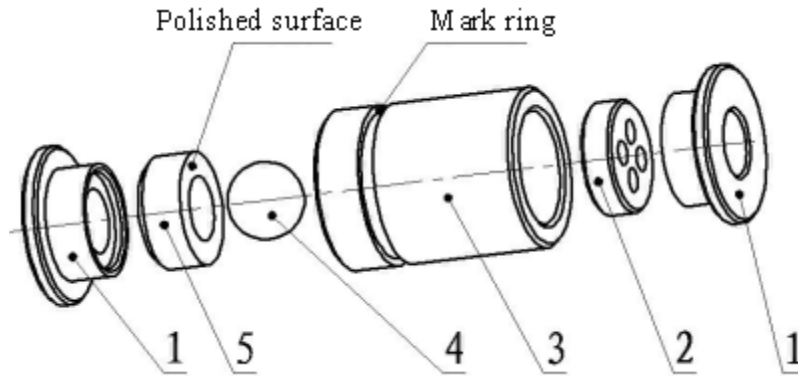


Figure 4-4: Assembly of the outlet check valve

1. Retainer seal, 2.Hole pad, 3.The marked retainer, 4.Valve ball, 5.Valve seat

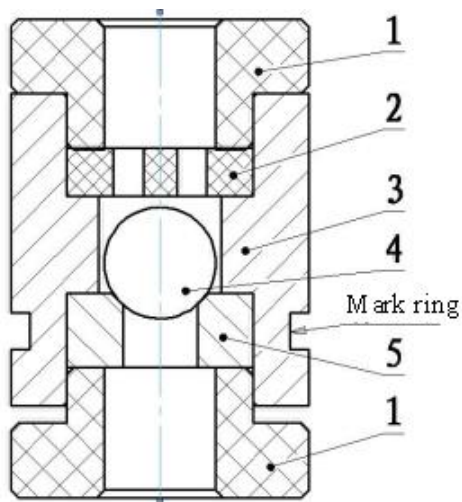


Figure 4-5: Cross-section of the outlet check valve

4.2.3 Cleaning the pump head

Crystalline salt may appear when using buffer salts for a long time. Crystalline salt is harmful to the seals and plunger rod. In order to avoid this situation, cleaning should be carried out frequently on the flow path and sealing ring. Customers can prepare a suitable cleaning fluid (such as distilled water and 10% methanol, 20% ethanol aqueous solution, etc.).



[Caution] Please add and replace the cleaning fluid in time.

4.2.4 Pump head disassembly and assembly

Methods for pump head disassembly and installation are as follows.

- 1) Cut off the pump power.
- 2) Remove the infusion line connected with the pump.
- 3) Open the shell.
- 4) Turn the belt to make the CAM reach the lowest point, push the pump head with force and rotate 40-45 degrees (the left pump head counterclockwise, the right pump head clockwise, shown in figure 4-6), and the pump head component can be discharged.
- 5) The installation sequence of pump head assembly is the reverse of disassembly.

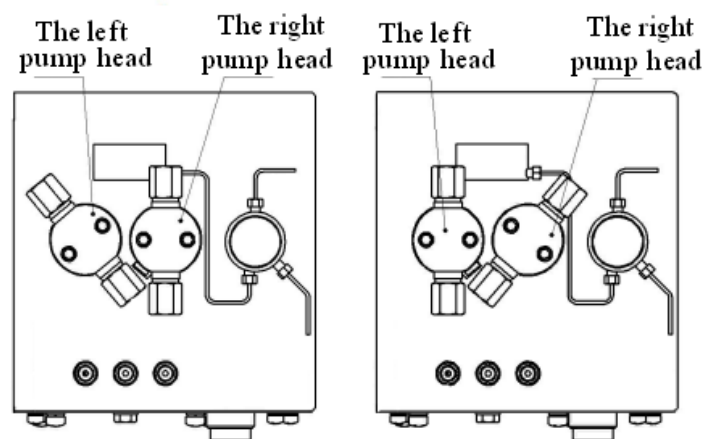


Figure 4-6: Pump head disassembly

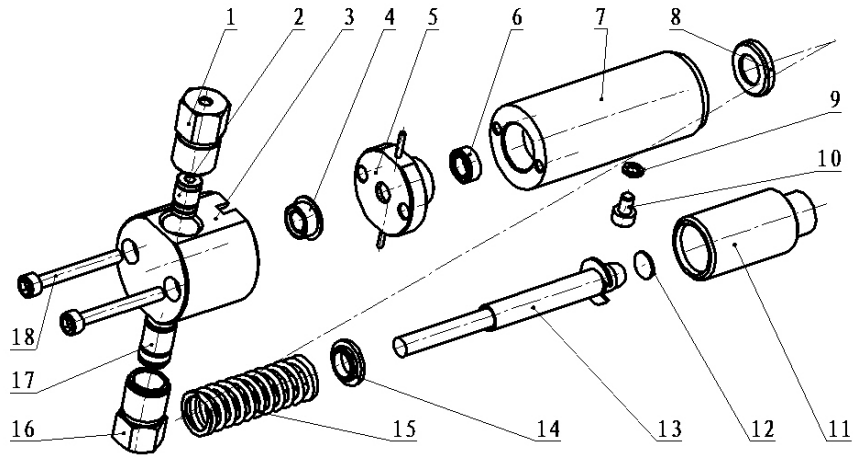


Figure 4-7: Pump head assembly

1. Outlet check housing, 2.Outlet check valve, 3.Pump head, 4.Primary seal, 5.Locating sleeve, 6.Secondary seal, 7.Plunger rod housing, 8.Spring outer positioning sleeve, 9.The gasket, 10.Screw, 11.Guide sleeve, 12.Gasket, 13.Plunger rod assembly, 14.Spring inside locating sleeve, 15.Spring,16.Inlet check housing, 17.Inlet check valve, 18.Set screw

Pump head disassembly and installation methods are as follows (Refer to figure 4-7).

Disassembly: Press and hold the guide sleeve (16) (to avoid the spring out), remove the screw (9) with the inner hexagon wrench, and then you can remove the plunger rod. Loosen the screw (1) and then remove the plunger rod sleeve (8) and positioning sleeve (6).

Installation: Assembly sequence is the reverse of disassembly. Pay attention to the plunger rod must be installed vertically so as not to break. After the plunger rod is inserted into the bottom, it will be rotated a few times to ensure that the gem rod has been inserted vertically.

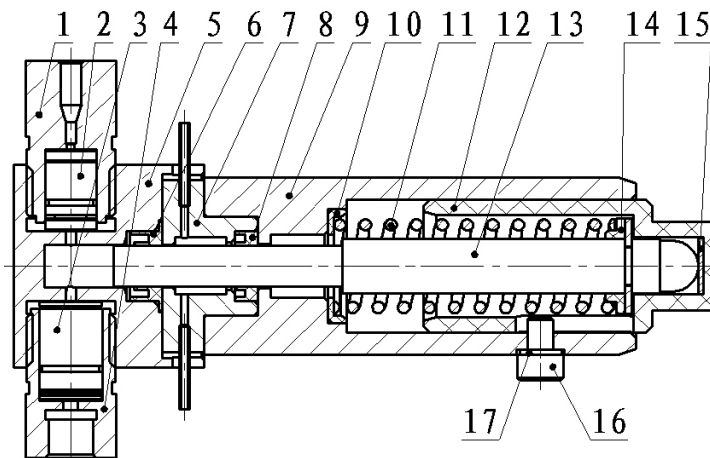


Figure 4-8: Cross-section of the pump head

- 1.Outlet check housing, 2.Outlet check valve, 3.Inlet check valve, 4.Inlet check housing, 5.Pump head, 6.Primary seal, 7.Locating sleeve, 8.The secondary seal, 9.Plunger rod set, 10.Spring inside locating sleeve, 11.Spring, 12.Guide sleeve, 13.Plunger rod assembly, 14.Spring outer positioning sleeve, 15.Gasket, 16.The gasket, 17.Screw



[Caution] When you assemble the pump head, enters, the left pump head s
ould be screwed in clockwise, and the right one is counterclockwise.

Plunger rod is easy to break. Be careful while unloading and assembling.

4.2.5 Plunger seal replacement

Plunger and plunger seal will wear out during long-term use. It is mainly related to the flow rate, working pressure and mobile phase. The impact of these factors is uncertain, so estimating the wear-out degree of those parts is difficult. It is necessary to check the surface of the plunger rod when replacing piston seal. If there is an even small scratch on the surface, please replace it. The method for plunger disassembly and installation can refer to “4.2.4 pump head assembly” above.

4.2.6 Fuse replacement

The fuse replacement process is as follows.

- 1) Turn off the power switch.
- 2) Remove the power cable from the power outlet.
- 3) Open the fuse box with a screwdriver referring to figure 2-6.
- 4) After replacing a new fuse, close the fuse box.



[Caution] Please use the same model fuse. Fuse model: T 1.5A/250V.

Chapter 5 Components and Material List

5.1 Consumption Parts

NO.	Describe	PN
1	Mobile phase bottle, transparent, 500mL	33110001
2	Mobile phase bottle, transparent, 1000mL	33110002
3	Mobile phase bottle, transparent, brown, 500mL	33130008
4	Mobile phase bottle, transparent, brown, 1000mL	33130009
5	PTFE tubing 4*2.5	13010038
6	Solvent inlet filter suite	18040014
7	3/16"-32 Stainless steel nut	14510027
8	1/16"Stainless steel ferrule	14990070
9	PEEK Finger Tight I	3215F-120X
10	A-type number tube	19000072
11	B-type number tube	19000073
12	Power cable	17000001
13	RJ11-485 line	82000020
14	T1.5A/250V fuse	15080003
15	Waste tubing	13010033

5.2 Replacement Parts

NO.	Describe	PN
1	Ground lead terminal	14010081
2	O-ring $\Phi 3.5 \times 1.8$	14992280
3	Plunger rod	14010011
4	Inlet check valve	18010080
5	Outlet check valve	18010081
6	Primary seal	14990084
7	Secondary seal	14990075

Appendix

Introduction for Tubing Materials

In a HPLC system, extra-column volumes in the column systems, tubing, fittings, injectors and detectors are likely to cause peak broadening. Improper tubing material will also lead to peak broadening, and even the sample degeneration, which affects the reliability of analysis results directly. Good tubing connection is an important way to fully exert the function of the instrument and improve the work efficiency.

Different tubing materials are chosen according to the system pressure and the properties of mobile phase and samples. There are several commonly used materials including stainless steel, polyether ether ketone (PEEK), polytetrafluoroethylene, polyvinylidene fluoride, polyethylene or polypropylene. The stainless steel tubing is the most common one.

Outer diameter of HPLC system connecting tubing is 1/16"(1.59mm). Inside diameter can be chosen according to your need. The regularly used inside diameters includes 0.007"(0.175mm), 0.01"(0.25mm), 0.02"(0.5mm), 0.03"(0.75mm) and 0.04"(1.0mm) ect.

Stainless steel tubing is generally used in high pressure part. In HPLC systems, the part from the pump to the column inlet is high pressure section. Stainless steel tubing is recommended. Stainless steel tubing have good corrosion resistance and precise coaxiality. The bore diameter match between tubing and fittings should be taken into consideration.

Also, polymer tubing can be used in many sections of HPLC systems, such as low-pressure parts including parts from the eluent reservoir to the pump, from detector outlet, from sampler waste outlet from draw-off valve outlet, etc. Polytetrafluoroethylene is inertial to HPLC solvents and is the most commonly used plastic tubing.

When the pressure is lower than 20MPa, PEEK tubing is more inert than stainless steel tubing and it is applied to biological sample analysis.


Safety Information

General safety information

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

Standard of security

The safety class of this equipment I (to provide ground protection terminal), and it is manufactured and tested according to national safety standard.

Symbols	Descriptions
	Before using equipments marked with this symbol, please refer to the instruction manual first to avoid harm to the operator and the equipment.
[Warning]	Casualties may appear. Please do not operate beyond the scope of warning, unless you have fully understood and met 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 fully understood and met the required conditions.

ELITEHPLC

About Elite

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