

# **SAC500mm 製備層析管柱系統使用手冊**

## **500mm Static Axial Compression Preparative Chromatography Column System Installation & User Manual**



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## 第一章 Chapter 1

### 總論 Subjects

感謝您使用格萊精密儀器有限公司生產的 SAC 層析系統. 使用前請仔細閱讀該說明書, 有疑問請及時與生產廠家取得聯繫.

SAC500mm 製備層析系統是一整套層析柱系統. 它既擁有動態軸向壓縮製備柱的優點, 又有螺桿快速下壓和上調的功能.

SAC500mm 層析系統是一種用於目標物質分離和純化的新型設備, 適合於百克級及公斤級的目標產物的分離純化生產.

SAC500mm 色譜系統是一種新的設備, 適用於目標物質的分離和提純, 以及適合於分離純化生產幾百克到目標產品的公斤。

Thank you for using the SAC chromatography system from Gelai Precision Instrument Co., Ltd. Please read the instructions carefully before use, and please contact us if any questions. The SAC500mm preparative chromatography system is a complete set of chromatography column system. It has the advantages of both Dynamic Axial Compression Preparative Column, and also has the rapid downward pressuring and upward adjusting functionality. SAC500mm chromatography system is a kind of new equipment, applied for the separation and purification of target substances, and is suitable for separating purification production of hundred grams to kilograms target products.

此系列的層析柱用於粗純化前處理化合物及植物提取物的混合物非常理想. 該設備不同於傳統的法蘭式管柱, 您可以自己裝填管柱, 比如實驗室或者是工廠. 裝填程序簡單, 普遍, 裝填時間不到一個小時. 另外, 因為有動態高壓油壓泵, 使得層析柱的效率可以達到一個非常高的水準.

This series is ideal for rough pre-purification process for crude compounds and plant extract mixtures. Being different from the traditional Flanged Column, you can pack the column by your own, such as in the laboratories or factories.

Packing procedure is simple, universal, finished in less than an hour. In addition, because of the dynamic high-pressure hydraulic pump is equipped, the efficiency of the column can reach a very high level.

#### SAC500mm 層析柱系統的優勢：

- 用於裝填內徑 500mm 的管柱
- 壓縮空氣驅動氣壓泵, 能提供高於 10bar 的工作壓力.
- 不需要電源, 因此更安全可靠.
- 用戶可自己操縱, 裝填管柱更便利. 推動填料的活塞壓力一直存在, 所以管柱能一直保持高效.
- 用最好的活塞密封圈, 使管柱可以長效使用.
- 手動功能使用戶方便快捷的完成裝填層析柱.
- 液流分配器的獨特設計, 管柱可以輕鬆達到高效分離能力.
- 柱體主要是 SUS316L 不銹鋼材料, 避免了樣品的污染.
- 過濾片孔徑為 20um, 適合填裝 30um 以上的高效填料.
- 柱裝填長度可根據客戶的需求裝填 700mm 至 900mm.
- 柱管可以自動校正位於柱體中心位置, 保證管柱裝填的同心度.

#### SAC500mm column system Advantages:

- The pushing piston continuously pressures on the column packing, so the column can remain high efficient.
- Use the best piston seal ring for long-term use of the column.
- Manual function allows users to complete column packing both quickly and easily.
- The unique design of the flow distributor, the column can easily achieve high separation ability.
- The material of the column main body is SUS316L stainless steel, avoiding contamination of samples.
- Pore size of the filter plate is 20um, suitable for high efficient packing materials more than 30um particle size.
- The column packing length can be customized to 700mm to 900mm.
- The column can automatically corrected to be located in the center of the cylinder, ensuring concentricity of the column packed.

## 第二章 Chapter2

### 系統描述 System Description



圖.1 SAC-500 略圖 (Figure 1. SAC-500 schematic diagram)

#### 柱體 Column

SAC500mm 層析柱包括一個柱體、活塞、千斤頂、加壓控制台、油箱、油路和柱架。

這是系統的主要組成部分，包括一個加工完備的柱管，柱頭及柱頭密封，含柱尾法蘭盤、含不銹鋼燒結過濾片、進項分配器和包覆密封圈。

SAC 500mm preparative chromatography column includes the column body, piston, jack, pressure controller, tank, oil pipe and column support base.

This is the main part of the system that includes a completely processed column, column head and seal, with column tail flange plate, stainless steel sintered sieve plate, inlet fluid distributor and wrapping seals.

出口排液管使用直徑 10mm" 標準的介面，很便利地使管子與泵和檢測器及餾分收集器或者收集瓶連接起來。

為了使管柱有更好的效果，保持管柱內壁，篩檢器及分配盤的清潔是非常重要的。

The output tube use standard 10mm type interface that connect conveniently with pump, detector, fraction-collector or collection bottle.

In order to ensure better effect of the column, keep the inner wall of the column, sieve and distributer clean is very important.

#### 注意 Attention!

不要用尖銳的東西接觸管柱內壁！

Do not touch column inner wall with sharp objects !

底端過濾片會被污染或塞滿小顆粒，如果重新裝填管柱，最好徹底清潔底端過濾片。比如，放入超音波池加有機溶劑至少清潔 30 分鐘。

The bottom side filter plate may be contaminated or blocked with small particles, and is preferably thoroughly cleaned before column refilled. For example, put for ultrasonic cleaning with organic solvent for at least 30 minutes.

## 活塞 Piston

活塞螺桿連接千斤頂，推動並壓縮填料達到需要的柱體內壓。

活塞有三層密封構成，並含有過濾板和液流分配器。

它是用來增大液壓並將壓力傳遞到柱床使活塞運動壓縮填料。

The jacks connect to piston screw to push and compress packing material to achieve the required pressure inside column.

The piston seal structure has three layers and contains the filter plate and the flow distributor.

## 千斤頂 Jack

它是用來增大液壓並將壓力傳遞到柱床使活塞運動壓縮填料。

初次裝填 SAC500mm 層析系統，必需認真測試油壓管路系統是否洩漏，長期使用導致洩漏會使壓力無法穩定。

For Initial packing of the SAC500mm chromatography column system, the hydraulic pipeline system must be carefully tested for leaks. Long-term use will result in leakage and pressure that can't be stabilized.

## 加壓控制台 Pressure control console

控制台給客戶提供了一個裝填和卸下裝填管柱填料的很好的操作介面。

The control console provides users with a good user interface for packing and un-packing column packing material.

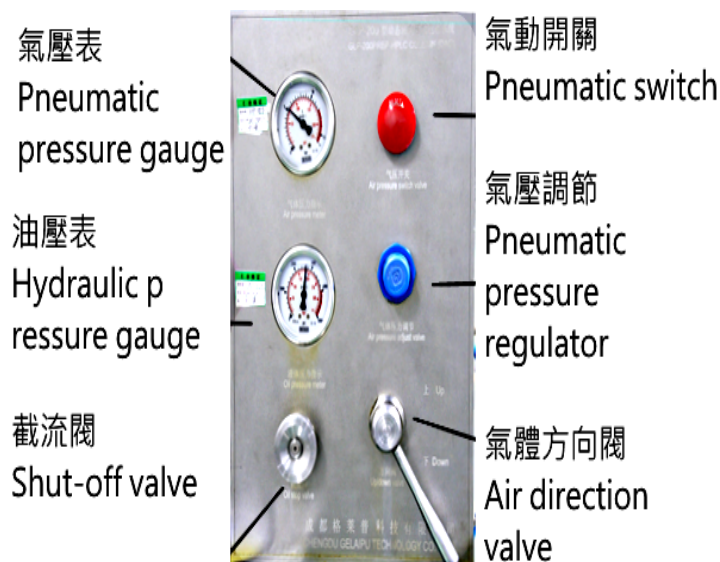


圖.2 加壓控制台 (Figure 2. Pressure control console)

在控制台上，有氣壓表，油壓表，截流閥，氣動開關，氣壓調節，以及氣體方向閥。

On the console, it has a pneumatic pressure gauge, hydraulic pressure gauge, shut-off valve, pneumatic switch, pneumatic pressure regulator and air directional valve.

油壓表顯示空氣驅動液體泵增大的壓力，與氣壓是成正比例的。這套系統可以提供柱體內部高達 10bar 的壓力，注意，壓力依賴與填料的機械穩定性。如果油壓過渡超過極限會破壞填料。

The hydraulic pressure gauge shows the pressure of the air-driven hydraulic pump, and is positively proportional to air pressure. The system can provide up to 10bar pressure inside the cylinder.

Note about the pressure and mechanical stability dependence of the packing material. The packing material will be destroyed if the oil pressure exceeds the packing material pressure limit..

方向閥用來變換活塞的運動方向。

Directional valve to change piston movement direction.

方向閥手柄有兩個方向，順時針“往下”轉動手柄活塞會向下運動至柱床，逆時針“向上”轉動手柄會抬起活塞遠離柱床。

Direction valve handle is in two directions. By turning the handle clockwise "down", the piston will be moved down to the bed, and turning the handle counter-clockwise "Up" will lift the piston away from the bed.

根據下面的提示，你直接使用氣壓開關即可停止活塞的運動。

According to the following tips, you can just use the pressure switch to stop the movement of the piston.

截流閥門開關：

不用設備時可把截流閥開關關閉，即刻停止活塞運動，並可保持柱內壓力不卸壓。

注意在使用時請把截留閥門開關打開。

如果異常情況發生，手柄可用來即刻阻斷氣壓以停止裝填或非裝填過程。

Shutoff valve switch :

When not in use the device, shutoff the valve to immediately stop the piston movement that will not release column pressure, and column pressure will be maintained.

Please note to open the shutoff valve when using the device.

If an exception occurs, the handle can be used to block the pressure immediately to stop the packing or un-packing process.

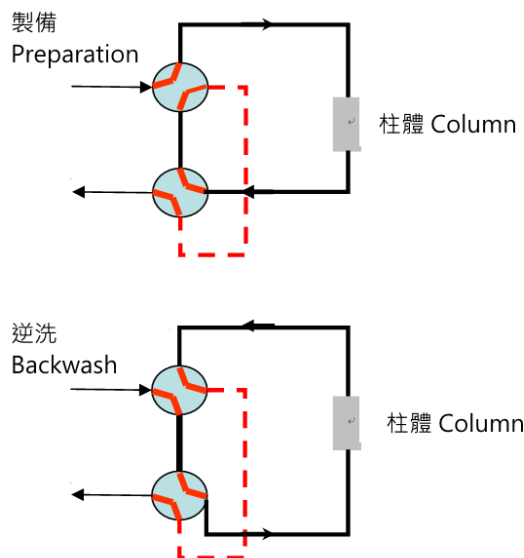


圖3. 流路轉向控制  
(Figure 3. Flow path switching control)

油缸及加壓控制箱

Hydraulic cylinders and pressuring control box

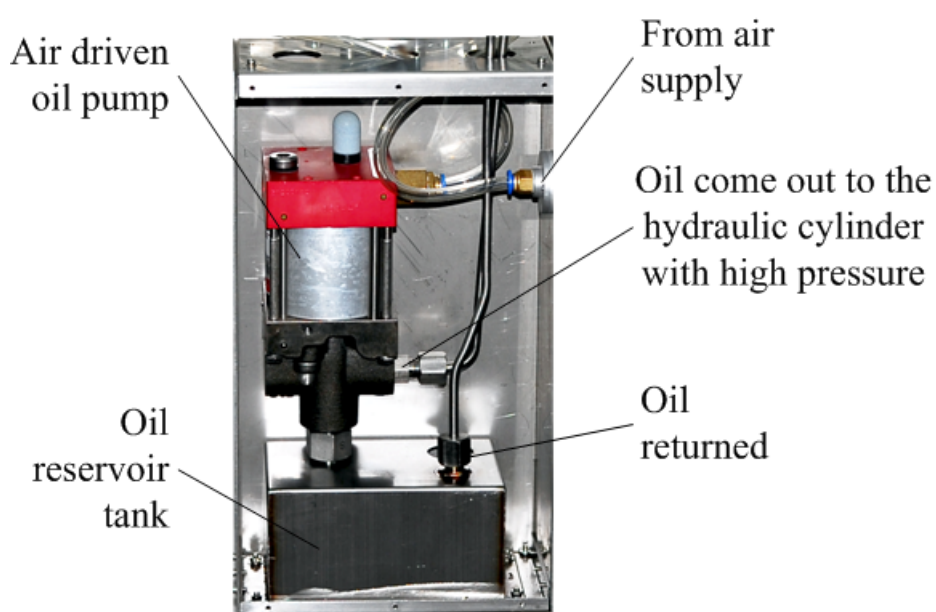


圖 4. 油缸及加壓控制箱圖解

Figure 4. Hydraulic cylinders and pressuring control box illustration

## 系統工作原理 System Works

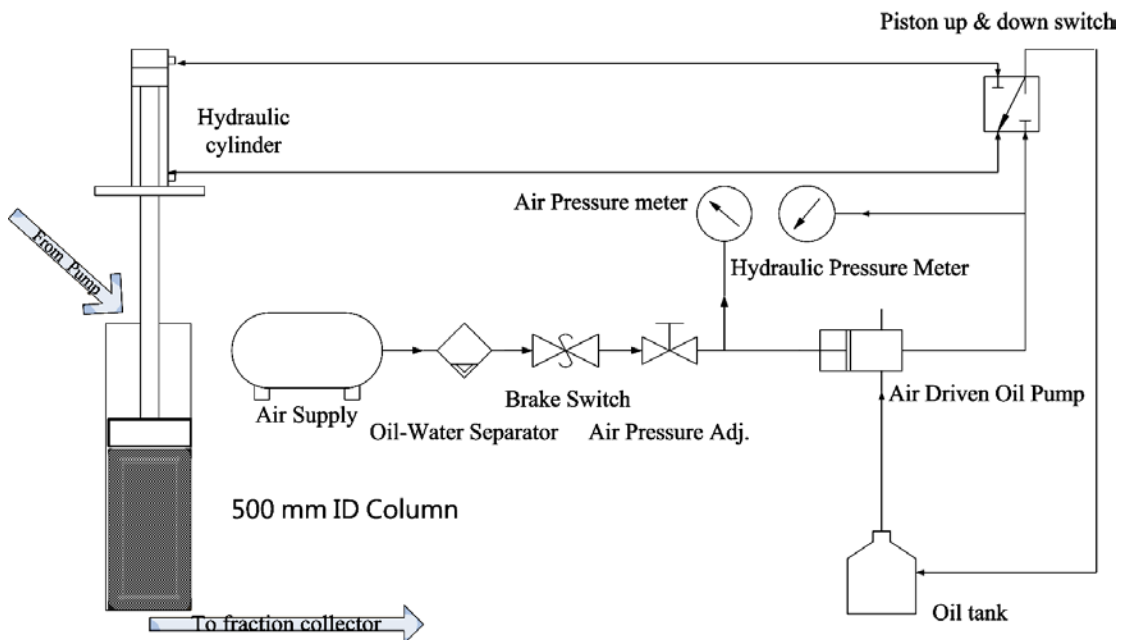


圖 5. SAC500mm 層析柱工作示意圖

Figure 5. SAC500mm Working schematic

手動旋轉螺桿轉盤，把柱頭快速壓向層析柱床。

打開壓縮空氣驅動油泵以驅動提供軸向壓力的油壓千斤頂，控制壓縮空氣來確定最終的油壓。

一旦達到設定的某個具體的壓縮油壓，驅動泵將處於“停止”狀態，不用持續操作也可以保持油壓。

當手動將柱頭快速接近柱床時，將氣動開關打開，這時驅動泵啟動頻率很快，達到設定值後啟動則啟動頻率會很少。

Manually and turn the screw wheel to quickly press the piston to the chromatography column bed.

Open the compressed air to drive the oil pump that will drive the hydraulic jack to provide piston axial pressure.

Control the compressed air pressure to determine the produced hydraulic oil pressure.

Once it reaches a specified hydraulic compression pressure, the driving pump will be in 'stop' state, and the hydraulic compression pressure can be maintained without continuous operations.

When the piston has been manually and quickly pressed to the chromatography column bed, Then, switch on the air-driven pump that will work frequently soon after startup, work rarely when reaching the set value.

氣體驅動液壓泵提供壓力，有幾種供氣選擇：中央壓縮空氣系統管路，壓縮空氣鋼瓶或者空氣壓縮機。如果使用空氣壓縮機，最好使用一些附件如濾水器來清潔輸入的空氣。保證輸入的空氣是潔淨的。

Manually turn the screw wheel to move and press piston quickly to column bed.

The air source is used to drive hydraulic pump for providing pressuring power. Types of compressed air sources: Central system compressed air pipe, compressed air cylinders, or air compressor. If air compressor is used, it is best to use some accessories such as water filter to clean the air input, ensuring clean input air.

閥門開關處於開或關的狀態以使用或關閉油泵。氣壓調節器能調節空氣壓力，用於產生油壓。油壓和氣壓分別在兩個表上有所顯示、一個是液壓指示表，另一個是壓縮空氣指示表。

Valve is switched to ON or OFF state to use or to turn off the pump. Gas pressure regulator can adjust the air pressure, for production of hydraulic pressure. Hydraulic and Pneumatic pressure is displayed separately on the two gauges, one for indicating hydraulic pressure and the other for compressed air pressure.

氣壓方向閥上下開關是一個控制方向的切換閥門。比如，當填充管柱或者安裝柱床支撐時，手柄通常是

“向下”的方向，而要使活塞抬升時，則是在“向上”的方向。

從油罐出來的油被油泵輸送到液壓筒。在液壓筒的上下排有兩個液壓連接器，液壓的流動方向依據方向閥上下開關。比如，如果手柄是向上的，油會從下面的進口流向上面的出口，再回到油缸。

The pneumatic directional valve is a up and down switching valve for direction control. For example, when packing column or installing bed support, the valve handle is usually in the 'down' direction, and is in the 'up' direction when lifting piston.

Oil out from oil tank is fed to the hydraulic cylinder by oil pump. There are two hydraulic connectors on the the upper and lower locations, and the flow direction depends on the upper and lower switching of the direction valve. For example, if the handle is up, the oil will flow from the lower inlet to upper outlet, then back to the oil tank

使用這套管柱，移動相將從柱床的入口流入，再從出口流到檢測器和餾分收集器或廢液瓶裡。

Use this column, the mobile phase will flow in from the inlet of the column bed, then and then to the detector and fractionation collector or the waste bottle from the outlet.

## 第三章 Chapter 3

### 安裝 Installation

為了成功的安裝和使用 SAC500mm 層析系統，需要以下的環境：

#### 氣源 Gas source

最少 100 立方英尺的壓縮空氣可以提供 8bar 的供氣氣源壓力。

#### 空間 Space

地面面積至少 2m<sup>2</sup>，高度至少 3m，輔助設備需要的空間(泵，檢測器，進樣系統) 以及移動相，移動相廢液，餾分收集瓶的存放等，根據實際需要決定。

In order to successfully install and use SAC500mm chromatography system, you need the following environment :

At least 100 cubic feet of compressed gas supply source to provide the pressure 8 bar

Floor area of at least 2m<sup>2</sup>, height of at least 3m, required space for auxiliary equipment (pump, detector, sample loading system) , as well as spaces for mobile phase, mobile phase waste, fraction collection bottles, according to the actual need to decide.

#### 通風 Ventilation

於使用的溶劑是易燃的和或者有毒的，所以要保證安裝 SAC500mm 層析柱系統的空間有良好通風系統。

Since the solvents used are flammable or toxic and, it is must to ensure the space for the installation of the SAC500mm column system has a good ventilation system.

#### 火源 Fire source

不要在安裝 SAC500mm 層析柱系統的屋內使用任何火源及熱源，不要在同一個屋內安裝易產生火花的裝置。

要在就近準備滅火器具，以防萬一。

Do not use any fire or heating sources and Do not install any device that is easy to produce sparks in the house that has he SAC500mm chromatography system installed.

Prepare ready fire extinguisher in the nearest locations to prevent exceptions and events.

#### 水池 Pool

眼睛或皮膚接觸溶劑會發紅，就近安裝於水池，在操作層析系統時請佩戴防護眼鏡和防護面具，以防範有機溶劑帶來的人身傷害。

系統接地線與地面相連。如果系統需要與易燃溶劑相使用，在安裝時需要維修師安裝接地線。

The contact of eye or skin with solvents is irritating and harmful, a closely mounted pool and flushing apparatus are necessary.

When operating the chromatography system , wear protective glasses and protective masks to protect against personal injury caused by the organic solvent.

System ground wire is connected to the ground. If your system requires the use of flammable solvent phase, a ground wire need to be installed by technicians at installation.

## 安裝程序 Installation procedure

從運輸箱搬離系統。

移去螺釘和固定層析系統的鋼絲線。

移去側板箱看見層析柱系統的包裝。

請用拖板車或吊裝設備小心地把層析系統從包裝箱內取出來。

層析系統自帶的四個輪子能方便地將層析系統安裝到使用現場。

設備到達現場後請用扳手將層析柱的四個固定腳固定好後就可以清洗設備了。

Moved away from the shipping container system.

Remove the screws and wire line fixed on the chromatography system.

Remove the side panel box to see the packaging of the chromatography column system.

Please use the pallet truck or lifting equipment to carefully remove the chromatography system from

the packaging box.

The chromatography system comes with four wheels for easy installation of the chromatography system to application site.

After the equipment has arrived at the application site, fix the four foot of chromatography column with a wrench, then the equipment is ready for cleaning.

### 壓縮空氣源連接

用快速連接器(quick connector)及空壓用塑膠管或金屬管，將壓縮空氣源連接到控制台的後面。

Connect Compressed air source

Connect compressed air source to the back of the console with quick connector and plastic tube or metal tube for pneumatic usage.

## 注意安全 Attention Safety

SAC500mm 層析柱使用強大的油壓驅動管柱的裝填過程，如果不適當操作，這股能量會造成嚴重的身體損傷，包括手和手臂的損傷。

The SAC500mm column apply powerful hydraulic force to drive the column packing process, and if improper operation, this energy can cause serious bodily injury, including hand and arm injuries.

### 運動部件 Moving parts

當需要在八個不銹鋼杆內部工作的時候，方向控制開關需處在 停止 的位置，一直保持活塞停止運動。

當設備的任何一個部件工作時，始終保持手在八個不銹鋼杆界限的外部。更多安全需要請壓下紅色的停止按鈕。

When you need to work in the space surrounded inside the eight stainless steel rod

The direction control switch needs to be kept in the Stop position to always prevent piston from movement.

And, if any parts of the equipment is working, your hand must be kept away from the boundaries surrounded inside the eight stainless steel rod.

More security needs, please pressing the stop button.

## 化學危害性 Chemical hazard

SAC500mm 層析柱的設計用於中壓移動相和高流速。通常，很有可能設備會發生洩漏，或由於溶劑的壓力塑膠管會失效。溶液和移動相可能有毒，腐蝕性，或者有其他危險性。為了安全使用層析管柱，眼睛的保護，防護衣和口罩及手套是有必要佩戴的。

SAC500mm column is designed for medium mobile phase pressure and high flow rate. Also typically, due to the pressure of the solvent or plastic tube failure, the device is likely to leak. And mobile phase solution may be toxic, corrosive, or other hazards. For safe use of the chromatography column, eye protection, masks and gloves and protective clothing is necessary to wear.

如果塑膠管用於高流速，內部由於靜電可能會產生火花。由於這個原因，有必要使設備與地面接通。

管柱系統只需要使用氣壓和液壓部分。

If the plastic tube is for high flow rates, it may produce sparks due to the internal static electricity.

For this reason, it is necessary to connect the device to the ground. The column system only requires the use of pneumatic and hydraulic parts.

## 第四章 Chapter4

### 快速啟動操作 Quick start operation

#### 第一步 Step 1

##### 準備 Prepare

當你要開始使用 SAC500mm 層析系統時，做好相關準備工作是必要的。

When you are going to start using SAC500mm chromatography system, it is must to complete sufficiently related preparatory works.

氣壓泵可使用兩種氣源。

一個是空氣另一個是氮氣瓶。無論選用哪種氣源，輸送到系統端的最小氣壓必須高於 6bar

You can use two kinds of gas source for the pneumatic pump.

One is the compressed air and the other is a nitrogen bottle. No matter which the gas source is selected, the minimum pressure transported to the system must be higher than 6bar.

##### 清潔 Cleaning

在你開始裝柱前，所有接觸填料和溶液的容器需要完全清潔乾淨。比如，柱筒體，過濾片，分配器，密封圈及其它。

Before begin your packing, all containers and solutions that contacts with the packing material need to be completely cleaned. For example, the column cylinder, filter sheet, distributor, seals and other.

判斷柱長以計算填料的重量。

比如，柱的實長實 800mm，填料的體積為：

$$V = \pi \times (500/2)^2 \times 800 \text{ mm}^3$$

結果是 157000,000.0 mm<sup>3</sup>

根據填料的密度而定，舉例來說，正相=0.48 g/cm<sup>3</sup>，反相=0.65 g/cm<sup>3</sup>。

如果知道填料的密度，上面的體積即可以換算出總重量是 75360g(正相)。

完成以上工作後，下一步就是為以下的裝填過程配製適合的漿液。

Analyzing column length to calculate the weight of the packing material.

For example, for a column of 800mm effective length, the volume of the packing material is

$$V = \pi \times (500/2)^2 \times 800 \text{ mm}^3$$

The result is 157000,000.0 mm<sup>3</sup>

According to the density of the packing material may be, for example, normal phase = 0.48 g / cm<sup>3</sup>, reverse phase = 0.65 g / cm<sup>3</sup>.

If the packing density is known, the above volume can be in terms of the total weight of 75360g (normal phase).

After completion of the above work, the next step is the preparation of the suitable slurry for the following packing procedure.

#### 第二步 Step 2

##### 勻漿 Homogenization

使用裝填用的溶劑仔細清潔容器和管柱內壁，確定表面沒有髒物質或者灰塵。

如上就算出填料的重量。

Clean packing material containers and the inner wall of the column carefully with solvent for packing, to assure no dirty material or dust in the surface.

Calculate the weight of packing material as in the preceding steps.

**溶劑法裝填:** 把填料和溶劑一起倒入容器, 用清潔的棒子混和(推薦使用自動勻漿機). 不同的填料有適合它的漿液, 即是說一定量的填料需要一定量的溶劑來調漿以達到最好的裝填效果, 注意, 勻漿總體積不能超過柱容量的 90%. 填料和勻漿液配比約 1g/2-4ml

Solvent introduced packing method: Put packing material together with the solvent into the container, and mix with a clean stick (automatic homogenizer is recommended).

Different packing material has its suitable slurry for it, that is, certain amount of packing material required suitable amount of the solvent to adjust slurry to achieve the best packing results.

Note: The total volume of homogenate slurry can not exceed 90% of the column capacity.

The ratio of packing material and homogenates is approximately 1g per 2-4ml.

### 第三步 Step 3

#### 裝柱 Packing

i. 手動把柱頭調至最高處, 把氣壓開關撥到 “開” 的位置.

使用 “方向閥開關” 將活塞往上移到最高處.

反時針轉動 “氣壓調節器” 使氣壓降到 0. 把氣壓開關推到 “關” 的位置.

將 “方向開關” 扳向下, 順時針轉動 “氣壓調節器” 將氣壓調到柱床所需要的壓力值.

比如, 如果柱內需要 8bar 的壓力, 則需要將千斤頂的油壓調到約 50bar,

又氣驅液壓泵比為 1 : 14, 即 3.57bar 氣壓就可以滿足層析床的 8bar 的要求.

Manually adjust the column head to the top position.

Turn the gas pressure switch to the 'ON' position.

Use the “directional valves switch” to move the piston up to the highest point.

Counter clockwise rotate “Pressure regulator” to decrease air pressure to zero, and turn the gas pressure switch to the 'OFF' position.

Pull the 'direction switch' down, clockwise rotate 'Pressure regulator' to needed pressure value of the column bed.

For example, if 8 bar pressure is needed inside the column, the hydraulic pressure of jack needs be adjusted to about 50bar.

Gas driving hydraulic pump ratio is 1:14, namely 3.57bar pneumatic pressure will meet the requirements of 8bar piston pressure on the chromatography column bed.

ii. 分別將活塞液路管和下法蘭液路管連接到泵和檢測器, 兩路管的液體走向均處於排空狀態.

參照圖 3.

Connect the piston liquid pipe and lower flange liquid pipe to the pump and detector. The liquid of the two pipes are in empty / purge state. Referring to Figure 3

iii. 將所有漿液迅速倒入管柱, 或者通過勻漿機倒入.

Quickly pour all slurry into the column, or introduced by a homogenizer.

iv. 鬆開 “截流閥”, 手動將活塞迅速下移, 注意當進入柱管的瞬間, 必須同心進入, 可預先調整好, 當接活塞的液路管有勻漿液噴出, 迅速轉動活塞閥關閉, 迫使勻漿液由下法蘭流出.

Release the 'shut-off valve', and manually move piston down quickly, pay attention to keep good concentric alignment between the piston and column in the contact and entering moment. It can be pre-adjusted. When there is homogenates begins to erupt out of piston liquid pipe, rapidly rotate to close piston liquid pipe valve that will force the homogenates

outflow to lower flange liquid pipe.

v. 步驟 iv.大概需要 5min, 活塞不斷地壓縮柱體, 柱體變得越來越緊密, 當活塞不再運動時, 將泵和檢測器分別連接在管柱控制台的進口和出口. 用 3 到 4 倍柱體積的移動相沖洗管柱, 逐步加快流速. 例如, 第一個柱體積用 1000ml/min 的流速, 第二個柱體積用 1800ml/min 的流速. 不要用高於 4000ml/min 的流速沖洗管柱.

Step iv. takes about 5min with the column bed continuously compressed by piston. The column bed becomes increasingly tightened. When the piston is no movement further, connect the pump and the detector to the inlet and outlet of the column console respectively. Run to flush column with mobile phase of 3-4 times column volumes, with gradually accelerated flow rate. For example, a first column volume with 1000ml / min flow rate, the second at 1800ml / min. Do not use flow rate higher than 4000ml / min for column washing.

vi. 對於沒有詳細的技術說明的新填料, 為了不磨損和損失填料, 通常開始的時候使用低壓逐漸地增加到適合的值, 這樣可以使填料損失減少到最少.

裝填條件確定好了, 盡可能裝填 80cm 的柱長. 大多以矽膠為基礎的填料, 異丙稀是被推薦的首要勻漿溶劑. 其他的勻漿溶劑包括丙酮, 二氯甲烷, 乙醇和甲醇. 使用者需要選擇適合的勻漿溶劑, 某些情況下卸下來的填料可再裝填和重新利用.

For new packing material with no detailed technical description, in order not to wear and loss of packing material, it usually begins with low pressure and gradually increase to the an appropriate value, and so can reduce the losses of packing material to a minimum. The packing condition is determined well, and as far as possible to pack 80cm in column length.

For mostly silicone-based packing material, iso-propylene is firstly recommended homogenized solvent. Other homogenate solvents include acetone, methylene chloride, ethanol and methanol. Users need to select a suitable homogenate solvent, and in some cases the unpacked packing materials may repacked and reused.

## 注意 Attention

i. 裝柱壓力控制在 3-8bar. 根據填料粗細, 填料越細, 柱壓可以相應增高.

Control column packing pressure in 3-8bar. According to the particle size of the packing material, column packing pressure can be increased corresponding to fine packing material With smaller particle size.

ii. 裝柱過程注意連接活塞輸液管不能被損傷.

Notice: Do not damage the infusion tube connected to piston in column packing process.

iii. 勻漿倒入後, 用少量液體淋洗乾淨柱口的填料, 以免影響密封.

After homogenized slurry poured, rinse with a small amount of the solvent to clean slurry on the mouth of the column head, so as not to affect the seal

## 第四步 Step 4

### 測試管柱 Column testing

完成裝填以後, 我們需要用標準的程序測試管柱的效果, 例如, 得出管柱的效率(N.T.P).

After the completion of packing, we need use standard procedure to testing column efficiency. For example, The derivation of Theoretical Plate Number (N. T. P ), etc.

管柱測試條件和方法 ( 參考 ) Column test conditions and methods (reference)

i. 反相的測試條件(Reverse phase test conditions) :

移動相：甲醇：水（85：15），流速：3000ml/min

樣品：甲苯 10ml/100ml 溶於甲醇，波長：254nm

Mobile phase: Methanol: Water (85:15), Flow rate: 3000ml/min

Sample: Toluene 10ml/100ml dissolved in Methanol, Wavelength: 254nm

ii. 正相的測試條件(Normal phase test conditions)：

移動相：氫甲烷（98%）+乙酸乙酯 Acetic ether(2%)

樣品：蔥 0.08mg/ml，波長：254nm

Mobile phase: acetonitrile (98%) + Acetic ether (2%)

Sample: Anthracene 0.08mg / ml, Wavelength: 254nm

## 第五步 Step 5

### 完成裝填 Packing completed

目前為止，SAC500mm 層析柱在通過測試後就已經可以使用了。

So far, SAC500mm column has passed test completely and ready for use.

## 第六步 Step 6

### 拆卸 SAC500mm 層析柱

#### Removing SAC500mm chromatography column.

i. 用準備好的可推高拖板車或吊裝設備，將 SAC500mm 層析柱吊離地面至少 300mm，拆卸掉支撐層析柱的可移動小板車，小板車和層析柱共計四個內六角螺釘連結，然後拆除掉層析柱的下法蘭，挖出層析矽膠，注意不要用尖銳的東西觸碰柱內壁，保護好柱內壁以免影響密封。

Lift the SAC500mm column off the ground at least 300mm with a ready prepared lifting pallet truck or other lifting equipment. Disassemble off the movable small bracket car that supports the column. The small bracket car link the column with totally four socket head cap screws. Then remove the lower flange off chromatography column, dig chromatography silica gel carefully and not to use sharp things to touch the inner wall of the column, so as to protect the inner wall finish of the column, and to prevent sealing effects decreasing.

ii. 將“氣壓調節閥”調節氣壓回復 0，扳動“方向開關”向上，卸載柱內壓，然後拆除下法蘭。  
Restore the adjusted air pressure of 'Pressure regulating valve' to zero. Flip 'Direction switch' upward to unload the column inner pressure, and then remove the lower flange.

iii. 將“方向開關”向下，緩緩旋動“氣壓調節閥”使活塞向下移動，柱體下面用器皿承接填料。  
Set the 'Direction switch' downward, slowly rotate 'Pressure regulating valve' so that the piston moves downward, and undertake packing material with utensils under the column.

iv. 填料出來完成後，將活塞緩緩提升到最高處，清辦法蘭、活塞、柱管。  
When all packing material have pushed out, slowly raise the piston to the highest position and clean flange, piston, column.

### 注意：

活塞下移過程中，勿將活塞壓出柱管，以免向上提拉損壞密封圈

### Attention:

Do not push the piston out of the column in the pistons downward process, to avoid seal ring damage by the pulling up of piston.

## 第五章 Chapter 5

### 修理故障 Repair failure

#### 活塞密封圈洩漏

##### Piston seal leakage

洩漏的活塞密封圈有必要換一個新的，這需要解壓，將活塞移開管柱。

管柱降壓之後，需要卸料，重新安裝，充填及加壓才能使用。

卸料之前需要測試以避免不必要的重裝。

It is necessary to replace a leaking seal with a new one, and it needs column pressure be released to remove the piston from column.

When the column pressure has been released, it needs to be un-packed, and installed, packed, and pressurized again for further applications.

Test to check if it is necessary before un-packed in order to avoid unnecessary un-packed.

#### 連接器處移動相的洩漏

##### Leakage of mobile phase at the connector site

萬一連接器介面處洩漏，則需擰緊螺絲，如果問題依然存在，換一個螺絲重新裝上。

In case the connector interface leaks, you need to tighten the screws, if the problem persists, replace the screws

#### 漏油

##### Oil spill

首先要找出什麼地方導致漏油。如果是連接器洩漏，旋轉 1/4 圈擰緊螺絲。

First, to find out what led to oil spills. if a connector leaks, rotate 1/4 turns to tighten the screws.

完成裝填以後，柱內的壓力將一直保持，油泵不再工作，如果此時油泵頻繁地工作，說明某個地方在漏氣，你需要仔細檢查。有時，肥皂水可以顯示漏口在什麼地方。

解決這個問題最簡單的方法就是擰緊連接介面的螺絲。

如果洩漏依然存在，請聯繫生產廠家。

After the completion of packing, the pressure within the column will remain, the hydraulic pumps will no longer work positively. If the pump frequently works in this situation, it means there are leaks in somewhere that you need to carefully check. Sometimes, soapy water can show and find where the leak happen.

The easiest way to solve this problem is to tighten the screw that connects the interface.

If the leak persists, please contact the manufacturer.

#### 低柱效

##### Low column efficiency

檢查填料是否適合裝填。

檢查溶液的混合物，裝填壓力和密封圈。

如果柱效急劇減少，你需要檢查一下線上過濾器 and 分配盤是否清潔。或者反向沖洗管柱。

Check if the packing material is suitable for loading.

Check the mixture solution, packing pressure and seals.

If the sharp reduction in column efficiency, you need to check if the in-line filter and distributor plate are clean, or backwash column if necessary.

### 使用一段時間後支柱壓很高

#### High column pressure after a period of application time

檢查活塞頭及線上過濾器，上分配盤和毛細管。

通常，線上過濾器和分配盤可以用純丙酮在超音波池裡清洗。

如果使用緩衝溶液作為移動相，最好事先使用蒸餾水清洗線上過濾器和分配盤。

有時，沖洗管柱是一個減小支持壓的好方法。

Check the piston head, in-line filter, upper distributor plate and capillaries.

Typically, the in-line filters and distributor plate can be cleaned using pure acetone in ultrasonic pool.

If you use a buffer solution as a mobile phase, it is preferably to prior to wash in-line filters and distributor plate with distilled water.

Sometimes, flushing the column is a good way to decrease supporting pressure..

### 注意

#### Attention

i. 使用 SAC500mm 層析柱前，務必將移動相和樣品溶解液過濾，0.45um 的過濾膜，否則將引起活塞篩板堵塞而導致柱壓升高，從而可能引起過濾篩板變形，使用柱壓如果超過 10bar，請查找原因後再投入使用。

Before using the SAC500mm column, be sure to filtrate the mobile phase and sample solution with 0.45um pore size filtration membrane, otherwise it will lead to blockage of piston sieve and causes column pressure elevation, which may cause deformation of the filter sieve.

If the pressure on using a column exceeds 10bar, look for the cause and resolve it, then put into use.

ii. 每天保持使用後反向沖洗柱床，30 分鐘-2 小時。

Keep to perform column bed backwashing daily after application for 30 minutes to 2 hours.

iii. 測試峰拖尾

Peak tailing test

混合物的比例不正確，太濃或者太稀。

總操作時間太長也會出現這種情況。

The ratio of the mixture is not correct, too thick or too thin.

It also occurs if the total operating time is too long.

## 第六章 Chapter 6

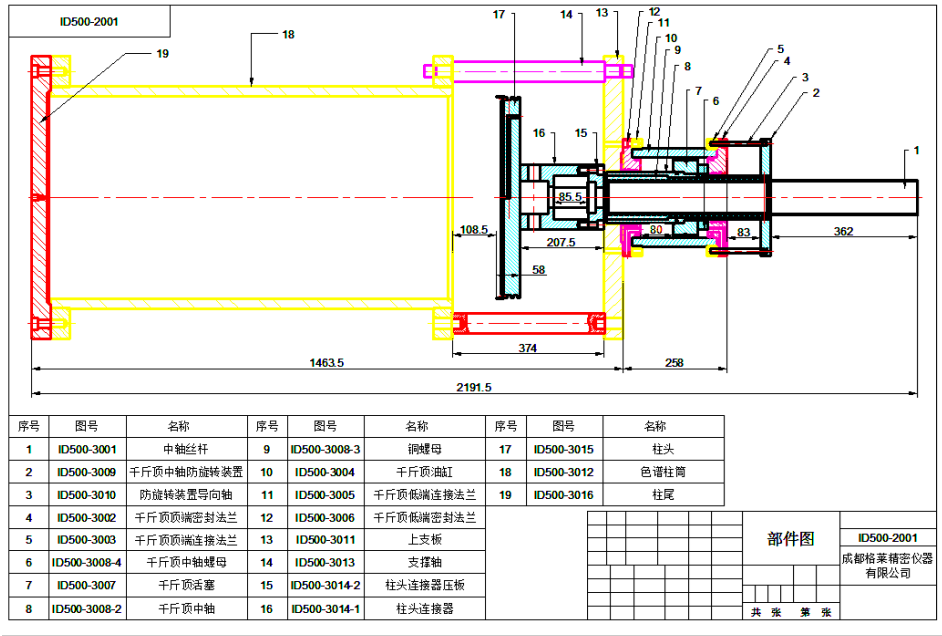
## 規格一覽表

## Specifications List

淨重 Net weight	1080kg- ID 500mm
尺寸 Size	800mm×800mm×2300mm-ID500mm
支架板車 Bracket car	材料: SUS304, Material: SUS304
柱體 Main column	材料: SUS316L, Material: SUS316L
管柱 Column	<p>內徑: 500mm, 外徑: 550mm, 管長:1000mm, 可裝填長度: 900mm, 柱管內表面光潔度: <math>Ra \leq 0.4 \mu m</math></p> <p>Inner diameter: 500mm, Outer diameter: 550mm</p> <p>Column length: 1000mm,</p> <p>Maximum packing length: 900mm</p> <p>Column Surface Finish: <math>Ra \leq 0.4 \mu m</math></p> <p>Material: SUS316L sintering</p> <p>Pore size: 20<math>\mu m</math></p>
過濾盤 Filter plate	<p>材料: SUS316L 燒結, 孔徑: 20<math>\mu m</math></p> <p>Material: SUS316L sintering, Pore size: 20<math>\mu m</math></p>
活塞 Piston	<p>材料: SUS316L</p> <p>手動螺桿傳動及油壓自動抬升和壓縮。</p> <p>Manually screw driving and hydraulic automatic lifting and compression.</p>
油壓千斤頂 Hydraulic jack	<p>材料: 304 不銹鋼內徑 200mm</p> <p>油壓千斤頂最大工作壓力: &gt;20MPa</p> <p>Material: 304 stainless steel, inner diameter of 200mm</p> <p>Hydraulic jack maximum working pressure:&gt; 20MPa</p>
壓力指示器 Pressure indicator	<p>氣壓錶: 0-16bar, 0.01 度</p> <p>油壓表: 0-350bar, 0.1 度</p> <p>Pneumatic pressure gauge: 0-16bar, 0. 01 degrees</p> <p>Hydraulic pressure gauge: 0-350bar, 0. 1 degree</p>
工作壓力 Working pressure	<p>層析柱<math>\leq 10bar</math> 最大. 活塞作用於柱床</p> <p>Column <math>\leq 10bar</math> maximum. Piston acting on the bed.</p>
溫度 Temperature	常溫, Room temperature
氣源要求 Air source	<p>潔淨氣源:0.6-1Mpa,</p> <p>Clean air: 0.6-1Mpa</p>
空氣及移動相連接介面, Air	空氣進出連接介面(Air In/Out connection interface): $\Phi 8$ mm 流動

and mobile phase connector	相入柱相連接介面(Connection interface of mobile phase into column): Φ10 mm 流動相出柱相連接介面(Connection interface of mobile phase from column outlet): Φ10 mm
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ID500-2001 部件圖紙



ID500-2001 部件清單

序号	零件名称	图号	页码	备注
1	中轴丝杆	ID500-3001		
2	千斤顶顶端密封法兰	ID500-3002		
3	千斤顶顶端连接法兰	ID500-3003		
4	千斤顶油缸	ID500-3004		
5	千斤顶底端连接法兰	ID500-3005		
6	千斤顶底端密封法兰	ID500-3006		
7	千斤顶活塞	ID500-3007		
8	千斤顶中轴半成品零件图	ID500-3008-1		
9	千斤顶中轴成品零件图	ID500-3008-2		
10	钢螺母	ID500-3008-3		
11	千斤顶中轴螺母	ID500-3008-4		
12	千斤顶中轴防旋转装置	ID500-3009		
13	防旋转装置导向轴	ID500-3010		
14	上支板	ID500-3011		
15	色谱柱筒	ID500-3012		
16	支撑轴	ID500-3013		
17	柱头连接器	ID500-3014-1		
18	柱头连接器压板	ID500-3014-2		
19	柱头	ID500-3015		
20	柱尾	ID500-3016		
21	O型圈、过滤板、分配片	ID500-3017		
22	圆锥滚子轴承、平面推力球轴承型号	ID500-3018		

序号	零件名称	图号	页码	备注
23	柱头连接器销子	ID500-3019		
24	可调节垫块	ID500-4001		
25	手动盘	ID500-4002		
26	手动盘螺母	ID500-4003		
27	气动泵接口螺钉	ID500-4004		
28	柱尾出液管夹板	ID500-4005		
29	千斤顶油缸夹板	ID500-4006		
30	机架轮子固定座	ID500-4007		
31	机架	ID500-4008		
32	柱尾转接头	ID500-4009		
33	柱头转接头	ID500-4010		

目录 ID500mm系统 成都格莱精密仪器有限公司

共 张 第 张

## 第七章 Chapter 7

### 生產商保證

#### Manufacturer guarantee

SAC500mm 層析柱系統自安裝後保固期 12 個月。密封圈及其它易耗品不在保固範圍。

如果是因為沒有按照使用手冊操作或非正常使用所造成的損害，即使在保固期內，仍需由用戶承擔材料的費用及運輸費用。

SAC500mm 層析柱系統已經正確裝填，所以能保證安全性。

如果部件損害或者不完整，請及時通知我們，強烈建議你們聯繫運輸商。

The warranty period is 12 months for the SAC500mm chromatography system since installation. Seals and other consumables are not covered by the warranty.

If damage is caused by

If the damage is caused from operations that is not in accordance with the operating manual, or caused by non-normal usage, even in the warranty period, the user still need to still assume the materials and transportation costs responsibility.

By correct packing of SAC500mm chromatography system, it ensures safety.

After shipment or transportation, if the part is damaged or incomplete, please notify us timely, that we strongly recommend you to contact the shipper concurrently.

### 訂購和服務信息, Ordering & Service Information :

Welcome to our web site to see our currently updated product information and catalog.

歡迎光臨我們的網站，看看我們目前最新的產品資訊和產品目錄。

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<http://www.chromnet.net/> , [http://chromnet.net/PreparativeDACHPLC\\_English.aspx](http://chromnet.net/PreparativeDACHPLC_English.aspx)  
[http://chromnet.net/Product%20Atlas\\_Preparative%20Chromatography%20Systems.aspx](http://chromnet.net/Product%20Atlas_Preparative%20Chromatography%20Systems.aspx)

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