CS-Prep HPLC Separation and Purification System

CS-Prep High Pressure Chromatography System and High Pressure Dynamic Axial Compression Column (DAC)

Products Profile
Contents

1. CS-Prep Chromatography System Profile

2. Product R&D and Quality Control
Larger Prep HPLC system mainly includes infusion, DAC, Slurry mixing, Detection, Injection, Fraction collection, Control and Data processing system.

http://www.hanbon.com.cn/

First Diaphragm Pump of Chromatography system for Commercial Scale in China
CS-Prep Chromatography System Profile

CS-Prep Chromatography System----Shape Sketch

CS-Prep500 Explosion-proof Double Diaphragm Pump for CS-Prep Chromatography System

http://www.hanbon.com.cn/
CS-Prep Chromatography System Profile

CS-Prep Chromatography System----Product Sketch

CS-Prep500 Explosion-proof Double Diaphragm Pump for CS-Prep Chromatography System
CS-Prep Chromatography System Profile

CS-Prep Chromatography System——Product Sketch

CS-Prep800 Explosion-proof Double Diaphragm Pump for CS-Prep Chromatography System
CS-Prep Chromatography System Profile

CS-Prep Chromatography System----Product Sketch

CS-Prep800 Explosion-proof One Diaphragm Pump for CS-Prep Chromatography System

http://www.hanbon.com.cn/
CS-Prep Chromatography System Profile

Diaphragm Pump Low-pressure Gradient System Flow Chart

- Pneumatic two-way ball valve
- Check valve
- Massflow meter
- Entrance
- Flow control valve
- On-line filter
- Solvent Pump
- Mixing
- Pressure transmitter
- Purge
- Massflow meter
- Injection pump
- Sample filter
- Pneumatic three-way ball valve
- Purge
- Detector
- Discharged liquid outlet
- Collecting port
- Start
- Purge
- Auto-injection
- Operation
- Backlash
- Bypass
- Manual injection

http://www.hanbon.com.cn/
1. Infusion
## Infusion--Configuration

### CS-Prep Chromatography System Profile

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Model / Material / Brand / Requirements</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The main framework</td>
<td>SUS304 Stainless steel</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Infusion Pump</td>
<td>Model:LDE3/M910S Diaphragm pump with three heads, Brand: LEWA, Maximum flow rate: 535L/H, Maximum Pressure: 100bar; 5-95%, Gradient accuracy: ±1%</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Gradient mixer</td>
<td>Material: SUS316L Stainless steel, provide material proof</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Flowmeter</td>
<td>German E+H Promass flowmeter, accuracy: ±0.15%</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Flow control valve</td>
<td>German GEMU, air driven flow control valve</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Injection pump</td>
<td>Model: EH2/M510S Diaphragm pump with double heads, Brand: LEWA, Maximum flow rate: 180L/H, Maximum pressure: 100bar, flow rate accuracy: ±1%</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>On-line filter</td>
<td>SUS316L Stainless steel, provide material proof; Diameter: Φ200 mm, Absolute porosity 5μm, rated porosity 2um, O type ring (FEP+SI)</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Pressure sensor</td>
<td>Brand: YOKOGAWA, Japan, Detection range: 0-10Mpa</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>pneumatic switching valve</td>
<td>pneumatic switching valve （Cock, T-pipe, Four-pipe）, the wetting material: SUS316L</td>
<td>20</td>
</tr>
</tbody>
</table>

The key part----LEWA Combined Metering Pump

Structure characteristics:

➢ Transmission: the chute axis can adjust the eccentric structure.

It can adopt the method of manual, electric and pneumatic.

The stroke adjustment structure

➢ Hydraulic end: it can use the head of diaphragm pump, plunger piston pump and special pump.

➢ It can be composed of a motor-driven multi-pumps.
The key part----GEMU Pneumatic Control Valve

Path: DN 6 – 80

Control pressure: 4-8 BAR

Medium pressure: 2.5 – 25 BAR

Work temperature: 180 °C (Teflon)

300 °C (Metal sealing material)

The valve material: Stainless steel

Control way: open(1), close(2), two-way driver(3)
The key part----GEMU Pneumatic Control Valve

1. The valve stem is more smooth and hard through the special cold rolling processing.
2. It has the stainless steel pneumatic head, which can be used under the harsh environment.
3. The range of the valve path is big, DN6-DN80.
4. The liquidity (Kv value) is better than the similar products.
5. The sealing material is PTFE, which can resist the temperature of 180 °C, and the metal sealing material can resist the high temperature of 300 °C.
6. The pneumatic head and valve body are sealed by the sealing rings of different materials.
7. The angle valve can resist vacuum, standard anti-vacuum sealing assembly 2061.
8. The standard products of U.S. and European markets equipment manufacturing industry in recent years.
The key part----E+H Promass Mass Flow Meter

German E+H Promass Mass Flow Meter is a multi-variable flow measurement system, it can be used in measurement explosion-proof certification of liquid and gas: ATEX、FM、CSA、and TIIS Food Industry/Sanitary requirement: 3A、FDA.

Multi-variable measurement can measure the mass flow rate, density and temperature at the same time.

Precision: Liquid: ±0.15%, Gas: ±0.5%
The key part----YOKOGAWA Pressure Sensor

Brand : YOKOGAWA    Detection range: 0-10Mpa

Japanese YOKOGAWA is the leader of the world's leading measurement, industrial automation control and information system.
The key part----Hanbon On-line Filter

Diameter: 200MM, the contacted material SUS316L/PTFE, the sieve: material: SUS316L, porosity: 5μm. The sealing ring: material: O type ring (FEP+SI), elastic sealing (PTFE).
The key part----EAGLE Pneumatic Switching Valve

It is controlled by pneumatic actuator to switch the system pipeline (Rushing, Recoil, By-pass and Fraction collector and so on), so that it can satisfy the requirement of explosion-proof.

Pressure requirement : 0.6~0.8 MPA
2、DAC

CS-Prep Chromatography System Profile

1、Cylinder Part
2、Support Rod
3、Piston Part
4、Column Tube Part
5、The Rack
6、Control System
7、Chain Clamp Part
8、The End Cap Part
<table>
<thead>
<tr>
<th>Name</th>
<th>Model / Material / Brand / Requirement</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>The rack</td>
<td>SUS304 stainless steel</td>
<td>1 SET</td>
</tr>
<tr>
<td>Column tube</td>
<td>SUS316L stainless steel, ID: 450mm, the length: 700mm, the effective packing height can be reached at 450mm, the inner wall roughness Ra≤0.2μm, the outer wall roughness Ra≤1.4μm</td>
<td>1 SET</td>
</tr>
<tr>
<td>The end cap</td>
<td>Material: SUS316L stainless steel&lt;br&gt;The sealing ring: material: O Type ring(FEP+SI), provide material proof&lt;br&gt;The polishing degree: the inner wall roughness Ra≤0.2μm, the outer wall roughness Ra≤1.6μm&lt;br&gt;Distributor: material: SUS316L, H-TREE shape distributor&lt;br&gt;The sieve material: SUS316L, porosity ≤2μm</td>
<td>1 SET</td>
</tr>
<tr>
<td>The piston</td>
<td>Material: SUS316L/PTFE stainless steel&lt;br&gt;The sealing ring: material: O Type ring(FEP+SI), the spring ring (PTFE)&lt;br&gt;The polishing degree: the inner wall roughness Ra≤0.2μm, the outer wall roughness Ra≤1.6μm&lt;br&gt;Distributor: material: SUS316L, H-TREE shape distributor&lt;br&gt;The sieve material: SUS316L, porosity ≤2μm</td>
<td>1 SET</td>
</tr>
<tr>
<td>Hydraulic pressure system</td>
<td>The control panel: material: SUS304 stainless steel&lt;br&gt;Hydraulic cylinder: material 45#, quenching and tempering treatment&lt;br&gt;Brand: Hanbon&lt;br&gt;Pressure gauge: Brand: MAXIMATOR detection range: 0-250BAR precision: 5 BAR&lt;br&gt;Air driven hydraulic pump: brand: MAXIMATOR&lt;br&gt;four-pipe, single-way valve, pressure retaining valve: material: SUS304 stainless steel, brand: EAGLE</td>
<td>1 SET</td>
</tr>
<tr>
<td>Gas control unit</td>
<td>Gas supply master switch: brand: Legris&lt;br&gt;pressure regulating valve/decantor: brand: SMC</td>
<td>1 SET</td>
</tr>
</tbody>
</table>
The key part----Hydraulic Cylinder

- The cylinder liner: material: 45# steel, quenching and tempering treatment, automatic welding and inspection treatment.
- The piston rod: hard chrom plating treatment of the surface. The coating hardness reaches 1000HV, has excellent abrasion resistance.
- The sealing ring: Using the Parker O type ring and closing ring.
The key part----Piston

Three sealing design ensures that there is no leakage under the high pressure, at the same time, it can adjust the axis automatically when the column tube is running, and has a long lifetime.

Guide sealing ring
The spring ring
Bowl type sealing ring
The material of the piston part is: SUS316L/PTFE/PEEK, which is matched with the standard of FDA、NSF

- H-Tree shape distributor
The key part----Column Tube

Adopt the latest lapping technology to improve the degree of finish of the inner wall and decrease the column wall effect.
CS-Prep Chromatography System Profile

The key part----Chain Clamp

To ensure the chromatography column packed and unpacked speedy and rapidly, Patent No.: ZL200620071223.8
MAXIMATOR has been among the market leaders in high-pressure equipment for more than 40 years. Since 1960s, MAXIMATOR started to design and manufacture high-pressure equipments, the company has manufactured Air driven liquid pump, Air amplifiers, Gas boosters, High pressure valve, High pressure tube nipples and High pressure tube and other hydraulic-related products.
DAC----Supporting tools

- Flip device of piston
- The foothold of the end cap and chain clap
- The foothold of the piston

CS-Prep Chromatography System Profile
DAC----Clean the Piston

The forklift takes the foothold of the piston and the piston to the down side of the flip device, and puts it to the proper place.

Making the piston fixed by the piston platen, and remove the foothold.

Turnign over the piston to the position on the right figure, then purge the piston.
DAC----The Way to Install the Piston and the End Cap

1. Press the cylinder head to the bottom, then move the piston to the end of the cylinder and lift it to the right place.

2. Connect the piston and cylinder head together by the connecting set, and they will be fixed by the connecting set platen.

3. Lift up the foothold to make the end cap and the bottom of the column tube parallel.

4. Remove the end cap and the chain clamp to the bottom of the column tube.

5. Fix the end cap and the column tube by the chain clamp.
3. Detection System

German Knauer 2500 Series, the bandwidth is 8nm, the wavelength ranges from 190 to 740nm, the wavelength accuracy is ±2nm, noise≤1x10^-5 AU, drift≤1.5x10^-4 AU/h. This detector can be controlled with Clarity software, as well as from the front panel (stand-alone operation), via analog input/output, or through an open protocol. Knauer 2500 features a highly flexible and compact design.
4. Industrial Controls System

We use PLC (Programmable logic controller) control system, usually both of the CPU and I/O adopt the redundant design, so it has a higher stability than the common PC or the single chip microcomputer system when it runs long. At the same time, PLC uses the modular design, which is convient to detect and repair, and has a high scalability as well.

The flow control adopts the close-loop control. It uses the mature PID control algorithm to achieve close-loop control through the real-time actual flow that the mass flow meter offers.
5. Slurry System

The slurry tank device: the maxium slurry volume is 120L, the rated slurry volume is 100L, pneumatic diaphragm pump for slurry transportation, pneumatic motor stirrer (Power: 2.2KW, Torque: 68nm, Rotational speed:150rpm)
6. Chromatography Work Station

Clarity supports GLP/FDA-21CFR PartII certification, the validity and security of data, system authentication tools (IQ/OQ) and system suitability test (SST) fully. It is coherent of the control instrument, sequence acquisition of the autosampler, automatic integral correction and report output with its batch processing function, which simplifies daily tedious analysis, also has the function of spectral comparison, re-calibration, input/output of the data and three-dimensional spectral processing.
7. Explosion-proof Design

Explosion-proof Design EN60079 Standard

Pneumatic components, explosion-proof electric components, positive pressure explosion-proof cabinet, explosion-proof joints
Contents

1. CS-Prep Chromatography System Profile

2. Product R&D and Quality Control
Product R&D and Quality Control

Perfect Quality Control System

Pass the Certificate for Measurement Confirmation, ISO9001 Certification and CE Mark from the European Union.

http://www.hanbon.com.cn/
(2) 任筒壁厚 $e$:

$$ e = \frac{P_d D_1}{2 \left[ \sigma \right] + \varepsilon} = \frac{2 \times 1000}{2 \times 118 - 2} = 8.5 \text{mm} $$

$P_d$ — 设计压力：2MPa

(3) 任筒壁厚验算:

工作压力 $P$ 要低于一定限度值，以保证工作安全：

$$ P \leq 0.35 \left( \frac{P_d^2}{D_1^2} - \frac{P_i^2}{D_i^2} \right) = 0.35 \times \frac{177 \times (1040^2 - 100^2)}{1040^2} \leq 4.67 \text{MPa} $$

验算拉杆的截应力 $P_i$:

$$ P_i = 2.3 \varepsilon \left( \frac{P_d}{D_1} \right) = 2.3 \times 480 \times \frac{1040}{1000} = 18.8 \text{MPa} $$

$P_i$ 远超过耐压试验压力2MPa。
Product R&D and Quality Control

Elaborate Product Testing
Thank You!

See you soon...