

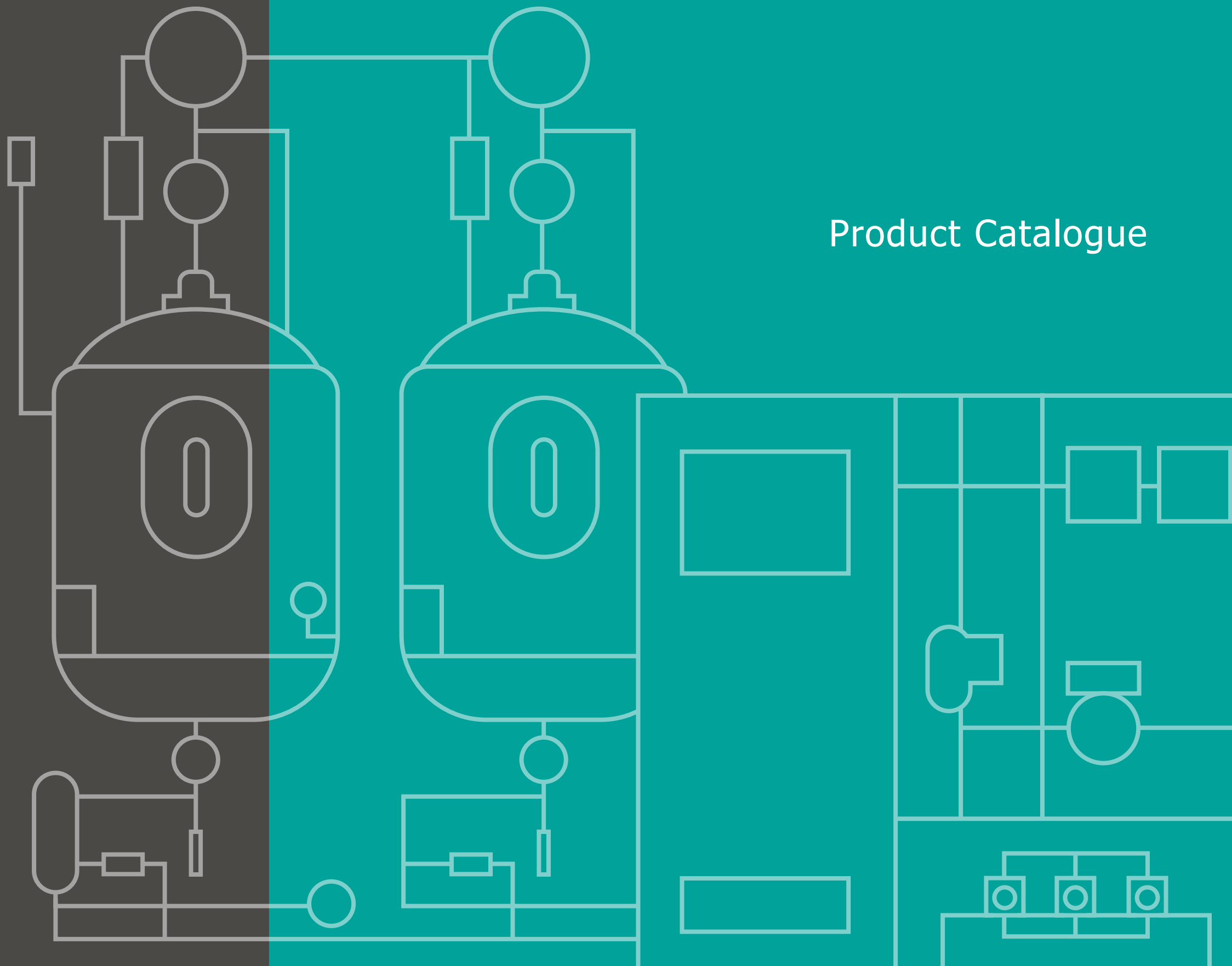
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**LISURE**  
PURIFICATION MADE SIMPLE.

## Product Catalogue

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## About Lisure



Founded in 2009, Lisure Science (Suzhou) Co., Ltd. is a Chinese national hi-tech enterprise located at Shengpu, Suzhou Industrial Park with production facilities totalling 35,000 m<sup>2</sup> and a 3,500 m<sup>2</sup> engineering design and application support center.

Lisure Science is a leading downstream processing equipment manufacturer and engineering solution provider for the biopharmaceutical industry, with a biopharmaceutical customer base of more than 1000. Our primary focus is GMP compliance equipments for biologics production processes such as process chromatography, in-line conditioning/dilution chromatography, ultrafiltration, normal filtration, depth filtration, virus removal and bulk dispensing.

Lisure provides engineering solution for automated continuous buffer preparation and management for the entire downstream processing and developing towards continuous bioprocessing and 'one-click' production. We also design and produce innovative products such as continuous chromatography system, automated ADC system and automated alkaline lysis system. With advance and precision engineering technology, technical expertise and production capacity Lisure is also the preferred OEM partner for some well-known multinational life science companies.

### Product line from laboratory, pilot, to process scale



Lab system



Pilot scale system



Process scale system

### Downstream Processing System and Solution



Chromatography System and Column



- Inline Conditioning Process Chromatography System/ICPC
- Continuous Buffer Management System/CBMS



UF, MF, NF, DF System



Custom Engineering System

- Continuous chromatography system
- Automated Alkaline lysis system (pDNA extraction)
- BDS Bulk dispensing system
- Antibody conjugate System

### Engineering Services



DSP Conceptual and engineering design



Facility layout design



DSP Application support and process validation



DSP Engineering and automation design  
Pipeline Engineering Design

### Other Services and Products



ASME BPE piping, SS piping and frame



Pharmaceutical pipeline engineering and installation



Slurry tank, Circulation tank, Prep tank, Concentrate tank, Intermedia tank (WIFI, PW, buffer, pour).



Welding service

## We are

The leading DSP equipment manufacturer in China

Our installed base  
Over 2100 process system and columns.



# 600+

TFF Filtration

# 900+

Process Columns

# 600+

Chromatography

# 140+

Inline Dilution  
/Conditioning

## Our core competencies

- Customer focus  
Customized Solutions Capability  
Have undertaken more than 800 custom design projects.
- Modular, process, systematic  
Manufacturing Capability  
Detailed document communication and tracking system.
- Digital, information, intelligent  
Overall Solution Integration Capability  
DeltaV + WINCC + CBS + CVS + HMI + DCS + PCS7...
- Innovative  
Product Innovation Capability  
Large diameter chromatography column supplier.

### Design Traceability

#### PLM

According to the latest PLM project design management software, Lisure conducts the traceability management of the design process to ensure that the design process can be traced and recorded.

### Customer Traceability

#### CRM/OA

Connect the market, sales, pre-sales, products, and after-sales business lines, collaborate efficiently across departments, establish a customer-centric business process, and form customer management traceability.

### Material Traceability

#### WMS/ERP

Warehouse system increases the traceability management of materials, ensures the traceability of each material, including materials used in customer equipment.

### Manufacturing Process Traceability

#### MES

Online management of the production management process, optimization of processes, abnormal production lines, and manufacturing schedules, to meet different delivery requirements.



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1

## Inline Conditioning Process Chromatography System (ICPC)

05-06 Inline Conditioning Process Chromatography System

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2

## Continuous Buffer Management System (CBMS)

07-08 Continuous Buffer Management System – Alternative to Tank Farm

---

3

## Custom Engineering

09 Custom Designed Systems

10 Downstream Process Conceptual Design

---

4

## Innovative Products

12 Automatic Continuous Conjugation ADC SU system

13 Automated Alkaline Lysis System

14 BDS Bulk Dispensing System

15 Continuous Chromatography System

16 Multi-column Chromatography System

---

5

## Chromatography System

17-18 Benchtop Pilot Chromatography System

19 Low Pressure Pilot-Scale Automated Chromatography System

20 Single-Use Chromatography System

21-22 Low Pressure Process-Scale Automated Chromatography System

---

6

## Chromatography Column

23-24 Electrical Motor Driven Axial Compression Columns

25 Pack-in-Place Chromatography Column

26 Manual Screw Driven Axial Compression Column

27 Lab-scale Chromatography Column

28 Chromatography Accessories

---

7

## High Pressure Chromatography System & Column

29 LIPERLA/LIPERCS Preparative HPLC Chromatography System

30 Dynamic Compression Column with Precision Control

---

8

## Filtration System and Cassette Holder

31-32 Fully Automated Ultrafiltration TFF System

33 Depth Filtration System

34 Virus Removal Filtration System

35 Single-Use Ultrafiltration System

36 TFF Cassette Holder

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9

## Tanks and vessels

37 HPHS Hygienic Slurry Tank

38 Hold Tanks

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## Inline Conditioning Process Chromatography System (ICPC)

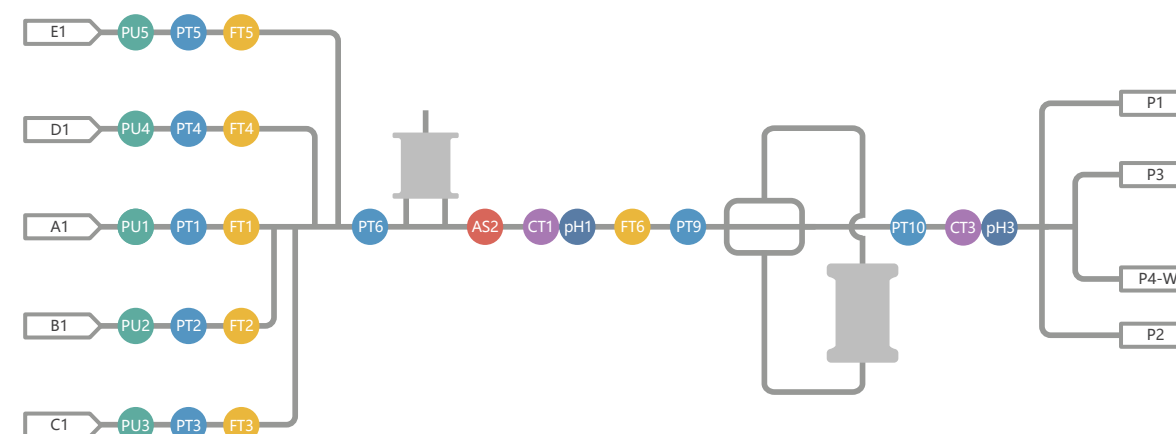
Inline conditioning chromatography systems are highly advanced technologies that have become an integral part of ensuring the safety, purity, and efficacy of biotherapeutics. These systems offer numerous advantages over traditional chromatography methods, including increased productivity, improved efficiency, and reduced operational costs. Lisure's Inline conditioning process chromatography (ICPC) systems are equipped with sophisticated sensors and controls that facilitate real-time monitoring and adjustment of critical parameters for automated preparation of buffer solutions that go directly into the column for equilibration, loading, elution, wash and regeneration. This level of automation ensures consistent and reproducible results, minimizing batch-to-batch variability and maximizing product quality. Overall, ICPC systems represent a cutting-edge solution for the purification of biomolecules in bioprocessing. Their integration of multiple purification steps, coupled with advanced monitoring and control capabilities, significantly enhance the efficiency, productivity, and outcomes of bioprocessing operations.

## Inline Conditioning Process Chromatography System (ICPC)



- Improved productivity: faster processing times and higher throughput, ultimately leading to increased production capacity.
- Reduced costs: fast buffer stabilization time making it a more economical option for large-scale production.
- Enhanced process control: provide real-time monitoring and control of the chromatography process. This ensures consistent product quality and minimizes the risk of product contamination or deviation from desired specifications.
- Flexibility and scalability: can be easily integrated into existing bioprocessing facilities, allowing for seamless scalability and flexibility. They can be adapted to various process formats, including batch, fed-batch, and continuous modes.
- Simplified operation: user-friendly interfaces and automation capabilities, simplifying operation, minimizes the potential for human errors, improving overall process reliability.
- Reduced footprint: compact designs, requiring less physical space compared to traditional chromatography setups.

## Inline Conditioning Process Chromatography System (ICPC)



Flow Chart

- Available for system flow rate up to 16000 L/H
- Flow rate accuracy  $\pm 1\%$ , conductivity accuracy  $\pm 3\%$ , pH accuracy  $\pm 0.05$  pH units.
- Support different control modes such as fixed ratio dilution and online detection signal feedback adjustment.
- On-line monitoring of multiple instruments ensuring the accuracy of buffer specifications.
- Stabilization time < 3mins as low as 15 secs.
- Dilution ratio: several fold to several tens of fold
- Custom design available
- No holding tank: qualified buffer goes into the chromatography column directly for equilibration, elution and other operations.



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## Continuous Buffer Management System (CBMS)

The system includes several specially designed modules that can be aligned to customer plant layout according to users' requirements.

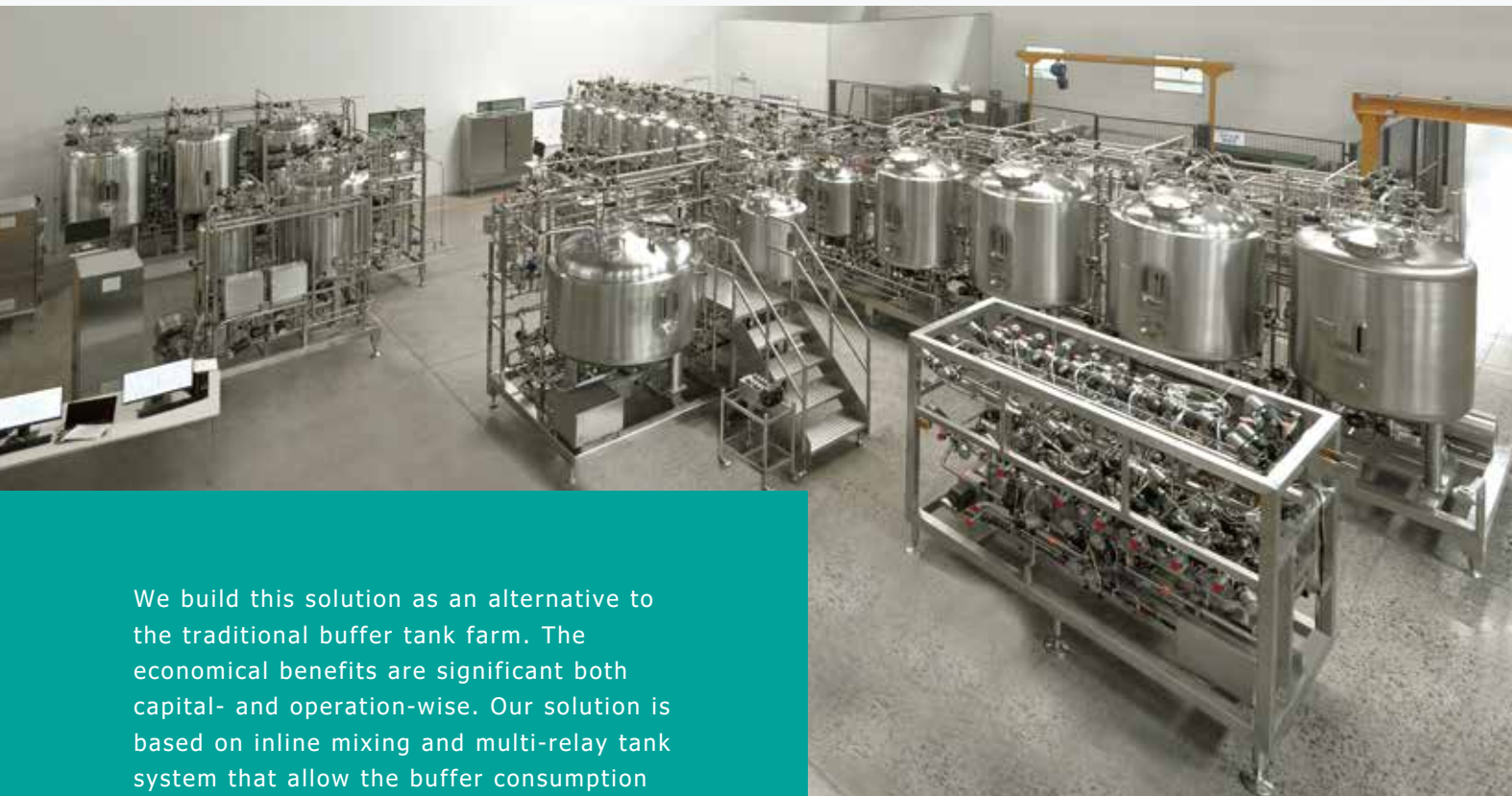
The system is designed in accordance with ASME BPE and cGMP regulations. Besides full documentation support for qualification, the system can be delivered with a full GAMP project execution to support process validation in cGMP environment.

Traditionally, buffer preparation has been a laborious and time-consuming process involving manual mixing, weighing, and monitoring of multiple components. However, with fully automated continuous buffer management systems (CBMS) manufacturers can now achieve significant improvements in efficiency, consistency, and GMP compliance.

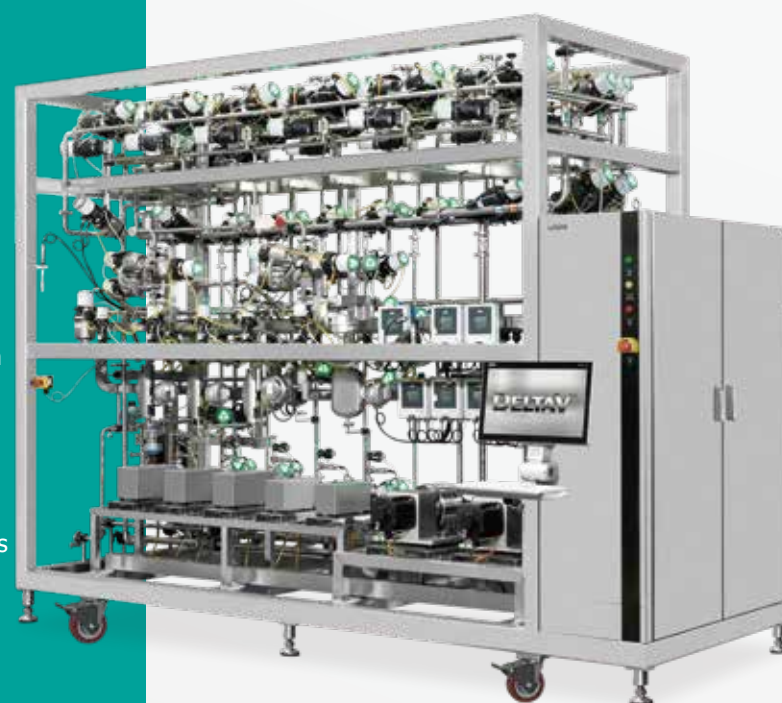
One of the key advantages of CBMS is the reduction of human error. These systems utilize advanced software and hardware technologies to precisely measure and dispense buffer components. By eliminating manual handling, the risk of inaccuracies and variations is significantly reduced, ensuring the exact composition of buffers required for downstream processes. This minimizes the potential for product variability and enhances process robustness in GMP biopharmaceutical production.

With CBMS, buffers can be prepared on-demand, precisely when needed, in the required quantities. This eliminates the need for excessive buffer storage and ensures that fresh buffers are always available. As a result, the manufacturing process can operate at optimal efficiency, reducing downtime and increasing overall productivity. Moreover CBMS offer enhanced traceability and accountability with advanced software for comprehensive documentation of buffer preparation, including precise measurements and time-stamping. This electronic recordkeeping facilitates regulatory compliance by providing a transparent and auditable history of the buffer production process.

## Continuous Buffer Management System (CBMS) – Alternative to Tank Farm



We build this solution as an alternative to the traditional buffer tank farm. The economical benefits are significant both capital- and operation-wise. Our solution is based on inline mixing and multi-relay tank system that allow the buffer consumption clients to use the buffer as if it were traditional tank farm. We made it a robust system by standardizing on system design and process control. Our innovative batch approach and continuous buffer filling strategy made the solution a viable alternative to traditional tank farm. Our team have the engineering capability to design and build the system to fit to your new or existing plant. Our experts bring in decades of experience of high end pharmaceutical hardware and flow system design, and process control solution design using DCS platform and S88 batch management standard. Our project execution follows a GAMP framework from Lisure Quality System to meet our pharmaceutical customers' need for process validation.



The system is aligned according to the customer's plant layout, process train, and specific buffer type/amount required. CBMS has been installed for production scale above 100,000 L



Computer calculates the components such as concentrates and WFI required to prepare the buffer according to pre-set formulas in the batch recipe.



Preparation of concentrate solutions is usually simple as most of them are designed as single-component solution.



Real-time inline monitoring of buffer preparation process ensures only qualified buffer goes into production process, with complete data logging capability.



Buffer preparation is based on patented flow control strategy with accurate massflow/PH/conductivity feedback with no requirement for manual sampling.



Valve proximity feedback, real-time monitoring of equipment status ensures production safety and stability.



Highly reliable industrial control platform (DeltaV), batch recipe complying with ISA88 batch operation standard, ensures the system can be easily integrated into plant DCS or MES.

Smaller tanks

Smaller footprint

Less capital investment

Lower operating cost

Scale up to 100,000L



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## Custom Engineering

One of Lisure's strength is our technical ability in solving tough custom engineering problems and our willingness to take on such projects. Lisure's engineering team does designs for not only hardware system and equipment but also process conceptual design, facility layout, and utility design. Lisure engineering team can help our customer right from the beginning of their new plant or existing plant expansion project. Lisure engineering team is capable of and has been working in partnership with many clients as their DSP total solution provider.

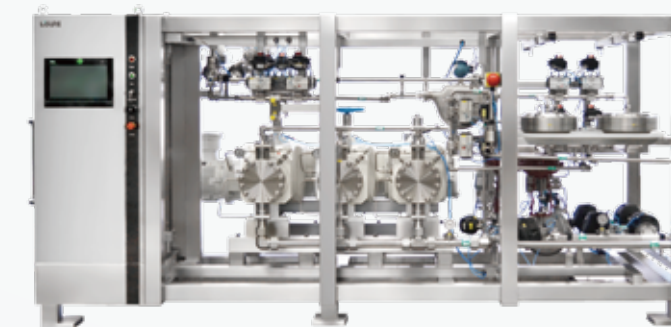
Our team has the engineering capability to design and build the systems to fit to customers' new or existing plant. Our experts bring in decades of experience of high-end pharmaceutical hardware and flow system design. The systems are designed in accordance with ASME BPE and cGMP regulations with full documentation support for qualification.

Our project execution follows a GAMP framework from Lisure Quality System to meet our pharmaceutical customers' need for process validation. Our systems and control solutions were designed, built, and tested to meet the specific requirements and challenges of each project. Lisure's expertise in custom engineering allows us to provide unique solutions that meet the needs of our customers' biopharmaceutical processes.

Lisure has been always aware of the importance of providing control solutions on OEM skids that can be readily integrated into the DCS/MES system in pharmaceutical plants. As a result we are able to provide not only PLC based local control solution but also DCS based solution such as those on DeltaV and PCS7 for almost all of our systems. Lisure process control solution takes advantage of industrial popular DCS platforms and S88 batch management standard. The systems have the data integration capability generally supported by the DCS platforms. Our engineering team has also been designing S88 complying batch operation solutions for the entire downstream processing for our customers in many of our DSP total-solution/integration projects.



Integrated Production System  
DF, IC & Chromatography



Ex Explosion Proof  
APPS Process

Examples of integration projects and custom designed products.



Stainless Steel  
Chromatography Column

For more information regarding custom engineering please contact:

✉ [marketing@lisure-us.com](mailto:marketing@lisure-us.com)

## Downstream Process Conceptual Design

Material balance calculation, water consumption scheduling, process equipment parameter calculation, flow chart, and etc., including the following outputs:

- Mass balance
- PFD
- Batch Schedule
- Water Consumption
- Buffer Calculation
- Control Topology
- CIP SIP Calculation
- Utility Requirement
- Equipment Specification
- Layout-EQ
- Equipment Summary
- Process PID
- EQL & Budget
- Project Scope
- URS
- FS
- Equipment LWH
- 3D Solidworks

Innovative Products

## Automatic Continuous Conjugation ADC SU system



Modular Design



Industrial-grade PLC



One-Stop Service



UV Detection



Clean & Safe Production



Online Monitoring

Lisure new ADC drug automatic continue conjugation system is used for R&D and production of ADC drugs. The single use pipeline design prevent any cross over contamination during the production process.

The software meets the compliance provisions of FDA 21 CFR Part 11.



- Modular design, which can be flexibly configured according to different process requirements.
- Industrial-grade PLC and software packing station based on PC control are with concise interface, integrated instrument control, method management, data analysis, standard curve, report editing, user authority management, audit trail, digital signature and other functions. They are in line with FDA 21 CFR, Part 11/GLP/GMP related regulations and requirements, and meet the requirements of the pharmaceutical industry for data traceability, security and other related requirements.
- One-stop service, configuration can be upgraded after installation to increase applicability and service life.
- UV detectors adopt diode array spectral detection devices and imported deuterium lamps' light source. Simultaneous display of multiple wavelength absorption values in the wavelength range of 190-700nm can be realized.
- Disposable pipeline design, no cross over contamination in the production process.
- Online automatic sampling monitoring to ensure product quality.

## Automated Alkaline Lysis System (pDNA extraction) /Tubular Hold Vessel For Continuous Processing



Precise Control



Multiple Scale



Easy to Clean



Easy to Use



Efficiency Improved



The first domestically developed Automated online alkaline lysis system, which is applied to the large-scale and sanitary preparation of super coiled plasmid DNA. It solved the problem of scale-up production of Escherichia coli alkali lysis, and improved the plasmid recovery rate greatly while maintaining the plasmid configuration.

- Precise control  
Precise control of various indexes such as buffer exchange, PH control, shear force control and lysis time during the lysis process.
- Multiple scale  
One machine for multiple use, suitable for different fermentation scales, to meet the use of pilot and process production.
- Easy to clean  
One-button CIP function, easy to clean.
- Easy to use  
The equipment has strong durability, suitable for long-term stable operation and low maintenance cost.
- Efficiency improved  
Seamlessly connect the front-end HF washing process and the back-end clarification and filtration, without manual intervention.

## Bulk Filling System (BFS)



High Dispensing Efficiency



Aseptic Packaging



Automation



- High dispensing efficiency:  
It takes only 2 min to finish dispensing 12L freeze-thaw bag, with dispensing accuracy  $\pm 50g$ . It can finish dispensing more than 1500L within 8 hours.
- Aseptic packaging:  
A customized 3D disposable pipeline is adopted, and with modular design to make it removable; Freeze-thaw bags and pipeline interfaces are equipped with sterile joints; Ultrasonic flowmeter; disposable pressure sensor probe; High precision peristaltic pump; The material/buffer inlet adopts CPC connector; Customized freeze-thaw bag transporter to save labor cost.

- Automation:  
Process-level software with data logging, authority classification, electronic signatures and phase editing function; Personnel only need to transport the freeze-thaw bag into the freezer, connect the freeze-thaw bags, and it can be operated by one person only.

## Continuous Chromatography System



Process time saving



Suit for high bed packing



Operation model adjustable



Inlet/Outlet valve SIP



One key production

### Compact Valve Design



4C Continuous Chromatography System is a brand new type of chromatography system with design and features that offers superior separation performance compared to traditional batch techniques:

- Continuous flow: Continuous flow of sample through the column. Ensures even distribution of sample and a higher utilization of the stationary phase.
- Higher throughput: A larger amount of sample can be processed per unit time, increasing the overall productivity
- Smaller column size: 4C operate at higher flow rates, which leads to faster separations and smaller columns
- Better efficiency: Due to the higher utilization of the stationary phase. as the sample flows through the entire length of the column use up to 4 Lab specification columns, control function through the system, each column can be switched in the steps of loading/elution/washing/regeneration at the same time.
- Superior automation and control features - provide robust process control during critical downstream step
- Automated systems can precisely control critical parameters, leading to reproducible and optimized separations. Control inreal-time allows for better control over the separation process and improved separation performance.
- Small system footprint : Switch functions are realized by a specially designed compact block valve containing 26 intergated valves
- Custom-designed Process scale 4C Continuous Chromatography available on request

## Multi-column Chromatography System



Time saving

High utilization  
rate

Flexible use

Small  
dead volumePowerful  
modular design

## Chromatography System

MCPC chromatography system is a specialized chromatography system, used in gel filtration chromatography, when the packing height exceeds 50cm or more of the chromatography column.

- The system is designed to drastically reduce pre-elution and post-elution processing times for gel filtration chromatography media.
- The system uses two combinable systems to select different automatic programs for separate and combined operations during elution/sample loading/processing.
- The system is designed to provide robust process control during this critical downstream step.
- Use up to 3 columns of production specifications, control function through the system, each column can be switched in the steps of loading/elution/washing/regeneration at the same time
- It supports multiple chromatographic columns to load samples in series, which greatly increases the sample load of the chromatographic packing and improves the utilization efficiency of the packing.
- Human-machine interface (HMI) commands to record key process parameters.
- The program of the system software realizes the continuity of the sample loading step through the automatic program control, such as the UV value target.

Lisure chromatography systems are carefully configured to provide the best operability for the users. Lisure chromatography systems range from low pressure, medium pressure, to high pressure systems and include custom engineering system such as continuous flow system, explosion-proof system, multiple columns serial-parallel system, automated buffer prep system, etc.

# Benchtop Pilot Chromatography System

## APPS Pilot



Reliable  
Performance



Valve Group  
Optional



Automatic  
Control



Online  
Monitoring



Signal  
Optimal



Flexible  
and Convenient



The APPS Pilot chromatography system is suitable for lab-scale product development, pilot-scale scale-up research, and small-scale GMP-level production and purification. This chromatography system adopts a humanized design concept and provides an integrated, modular, and standardized system. It can run automatically and stably to achieve processes such as equilibrium, sample loading, elution/gradient elution, collection, cleaning and regeneration. Various instruments and valves have excellent performance, follow hygienic design, and have regular and compact structures.

- Strong performance, easy operation and high efficiency.
- High-performance hygienic diaphragm pump, complying with GMP requirements.
- High-precision ultrasonic flow meter, capable of constant flow control.
- Patented hard tube quick connector for easy connection.
- The specially designed solenoid block valve can realize multiple functions and comply with GMP requirements.
- The specially designed solenoid block valve can realize multiple functions and comply with GMP requirements.

### Specification

|                            |                                                                                                                                                                          |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Footprint                  | 815 x 700 x 890mm                                                                                                                                                        |
| Weight                     | 90 Kg                                                                                                                                                                    |
| Pipe Size                  | 3/16"OD, 1/8"ID                                                                                                                                                          |
| Working Pressure           | 0~6 bar                                                                                                                                                                  |
| Working Temperature        | 2~40°C                                                                                                                                                                   |
| Working Humidity           | 5%~95%                                                                                                                                                                   |
| Power Supply               | 220V, Single phase three wire electricity                                                                                                                                |
| Protection Class           | IP33                                                                                                                                                                     |
| System Pump                | A/B diaphragm pump<br>Flow rate range: 10 ~600 mL/min<br>Pressure resistance: 0~6 bar                                                                                    |
| Ultrasonic Flow Meter      | Flow rate accuracy: ±1%                                                                                                                                                  |
| UV Detector:               | Range: -5AU~5AU, in 0~2AU, linear accuracy is ±2%;                                                                                                                       |
| Multi-wavelength detection | Wavelength range: 200~400nm;<br>Optical path: 2mm;<br>Wavelength accuracy: ±2nm<br>Noise: 1.5×10 <sup>-5</sup> AU<br>Optional LED light source, service life >8000 hours |
| pH Detector                | 0~14, within range 2-12, accuracy ±0.1                                                                                                                                   |
| Pressure Detector          | 0-6 bar, accuracy±0.1bar                                                                                                                                                 |
| Column Position Valve      | Single/double optional, double columns in series, intelligent column loading function                                                                                    |
| Inlet                      | Max. inlet 12 pcs, A1~A6, B1~B6                                                                                                                                          |
| Outlet                     | Max. outlet 6 pcs, P1~P6                                                                                                                                                 |
| Software System            | CBS 1.2.0                                                                                                                                                                |
| Control System             | PLC 1500, benchtop PC                                                                                                                                                    |

# Low Pressure Pilot-Scale Automated Chromatography System

- 

Flexible
- 

Reliable
- 

Configurable
- 

Automated
- 

Real time monitoring

- Movable chassis, frame, skid design.
- High-precision membrane pump, minimized pulsation, reliable performance over long-time operation.
- Options for Pneumatic or electric valves.
- 200-400nm UV Spectral monitor with adjustable optical path length, supporting multi-wavelength simultaneous monitoring.
- Fully automated using industrial control software such as DeltaV and WinCC.
- Sample concentration, so that the UV detection signal can reach the optimal level.



## Specification

|                             |                                  |                              |                      |
|-----------------------------|----------------------------------|------------------------------|----------------------|
| Recommended flow rate range | 0.6-48 L/H                       | Pipe Material                | 316L Stainless Steel |
| Footprint                   | 650*1350mm                       | Pump Head Material           | 316L Stainless Steel |
| Height                      | 1150mm                           | Pressure Rating              | 0-6 bar              |
| Weight                      | 300kg                            | pH Detection Range           | 0-14                 |
| Pipe Size                   | 1/4 inch                         | Conductivity Detection Range | 0.01-300ms/cm        |
| Pneumatic supply            | 8mm, 5-7bar, No oil or particles | Flow Rate Accuracy           | 1.00%                |
| Power Supply                | 220V, single-phase three-wire    | Protection Class             | IP54                 |

# Single-Use Chromatography System

- 

Compatibility
- 

Sanitary piping and probe
- 

High low flow kit
- 

Quick installation



- Wide range of flow rates, the two sequences of systems cover the flow rate range from 4l/h-2000l/h, and the pipeline kit includes 1/4 inch, 1/2 inch, 3/4 inch, 1 inch. Allow customers to choose the best pipeline within the recommended range, the maximum operating pressure can reach 4Bar
- Optional gradient kit, supports gradient elution and online dilution
- Easy to install, the pipe can be snapped into the slot directly
- Inlet pump with slide rail design, convenient and quick installation/removal of pump tube
- Optional valve status detection sensor
- Special finishes available, 304 or 316L stainless steel
- Pinch valves are calibrated for clamping force, clamping clearance and stroke to ensure optimum performance
- Configure APPS CBS software, comply with FDA 21 part11 requirements, and provide complete verification documents. In addition, Emerson Delta V operating software is optional, supporting DCS database merging

- Disposable flow path: Single-Use, ready-to-use and disposable, which can meet the purification of difficult-to-clean products and avoid cleaning validation challenges; Flow path standard design, produced in a C-level workshop, provides a sterile irradiated version, which can guarantee immediate Disassemble and use; Easy to install, support quick installation or disassembly, reduce preparation or cleaning time between batches; supported by complete verification documents, in line with GMP/EP/USP and other regulatory requirements.

# Low Pressure Process-Scale Automated Chromatography System

- 

Hygienic Design
- 

cGMP Compliant
- 

Reliable
- 

Multiple Control Platform Available
- 

Highly Configurable



APPS Process chromatography system is designed for large-scale production process of biological products. The system design of APPS Process complies with ASME BPE and cGMP standards. The system is integrated, modular, and standardized with various configurations that meet different requirements from our users.

The system can be run automatically to achieve typical process steps of chromatography such as equilibrium, sample injection, wash, elution, collection, cleaning, regeneration, etc.

System documentation is available to fully support qualification and validation for cGMP regulated customers.

- APPS Process includes a series of models that cover a wide range of flow rates and specifications to meet the process requirements of customers.
- Components are supplied by internationally renowned manufacturers. They are identical or comparable to the best on the market.
- Hygienic design complying with ASME BPE and cGMP requirements.
- Multiple control platform available: Emerson DeltaV, Siemens WinCC, CBS software developed based on Labwindows, fully complying with FDA 21 CFR Part 11 requirements.
- Userfriendly interface: simple, stable, and easy to operate.
- Full documentation support for qualification and validation for cGMP regulated customers.

## Specification

| Product Number<br>(Item Number) | Recommended Flow<br>Rate Range<br>(L/H) | Max Flow Rate<br>(L/H) | L*W*H<br>(mm)  | Piping Size<br>(inch) | Power Supply                | Weight<br>(kg) |
|---------------------------------|-----------------------------------------|------------------------|----------------|-----------------------|-----------------------------|----------------|
| APPS Process DN8                | 3-60                                    | 72                     | 1250*650*1770  | 1/4                   | 220V,single-phase           | 300            |
| APPS Process DN10               | 6-150                                   | 180                    | 1450*650*1770  | 3/8                   | 220V,single-phase           | 300            |
| APPS Process DN15               | 16-600                                  | 800                    | 1460*650*1770  | 1/2                   | 220V,single-phase           | 350            |
| APPS Process DN20               | 24-1000                                 | 1200                   | 1460*650*1770  | 3/4                   | 220V,single-phase           | 400            |
| APPS Process DN25               | 150-2000                                | 3300                   | 1700*1030*1770 | 1                     | 380V,three phase five wire. | 500            |
| APPS Process DN40               | 500-5000                                | 10000                  | 3150*1400*2150 | 1.5                   | 380V,three phase five wire. | 600            |
| APPS Process DN50               | 800-16000                               | 20000                  | 3150*1400*2150 | 2                     | 380V,three phase five wire. | 650            |

All APPS Process has:

|                               |                      |                     |                |
|-------------------------------|----------------------|---------------------|----------------|
| Protection level:             | IP55                 | Pneumatic supply:   | 8mm, 5-7 bar   |
| Piping /Pump head material:   | 316L stainless steel | PH Detection range: | 0-14           |
| Pressure rating:              | 6 bar                | UV Detection:       | 200-400nm      |
| Flow rate accuracy:           | 1.00%                | Bubble trap:        | Compact Design |
| Conductivity detection range: | 0.01-300ms/cm        |                     |                |



## Chromatography Column

Lisur chromatography columns include following models: GCC, SAC, EAC, DAC and ABH. These models of columns meet the needs from lab scale process development, to pilot scale development, to full scale commercial production. The inner diameters of the columns range from 15mm to 2000mm. Custom made columns are also available.

PURIFICATION MADE SIMPLE.

Electrical Motor Driven Axial Compression Columns (EAC-Bio)

- 

cGMP Compliant
- 

Hygienic Design
- 

Patented Design
- 

Easy Maintenance
- 

Reproducibility
- 

Easy Operation
- 

Validation Support



- Designed for cGMP production. Contact Materials comply with FDA/USP Class VI requirements.
- Hygienic design, Clean-in-place.
- Applicable to many different resins.
- Patented distribute plate design ensuring even flow distribution through the column.
- Transparent acrylic column tube, with rotatable design to make column cleaning and maintenance convenient.
- Reproducible packing operated from the packing station.
- IQ/OQ documentation support customization provided.
- Packing station included.

Specification

| Product Number<br>(Item Number) | Inner Diameter<br>(mm) | Column Height<br>(mm) | Packing Height<br>(mm) | Bed Volume<br>(L) | Pipe Size | Power Supply | Footprint<br>(mm) | Weight<br>(kg) |
|---------------------------------|------------------------|-----------------------|------------------------|-------------------|-----------|--------------|-------------------|----------------|
| EAC-Bio 300-700                 | 300                    | 700                   | 10-570                 | 0.7-40.3          | DN10      | 100-400V     | 500*1100          | 230            |
| EAC-Bio 300-900                 | 300                    | 900                   | 10-770                 | 0.7-54.4          | DN10      | 100-400V     | 500*1100          | 250            |
| EAC-Bio 400-700                 | 400                    | 700                   | 10-570                 | 1.2-71.6          | DN10      | 100-400V     | 600*1050          | 400            |
| EAC-Bio 400-900                 | 400                    | 900                   | 10-770                 | 1.2-96.7          | DN10      | 100-400V     | 600*1050          | 425            |
| EAC-Bio 400-1100                | 400                    | 1100                  | 10-970                 | 1.2-121.8         | DN10      | 100-400V     | 600*1050          | 450            |
| EAC-Bio 450-700                 | 450                    | 700                   | 10-570                 | 1.6-90.6          | DN10      | 100-400V     | 630*1310          | 450            |
| EAC-Bio 450-900                 | 450                    | 900                   | 10-770                 | 1.6-122.4         | DN10      | 100-400V     | 630*1310          | 490            |
| EAC-Bio 450-1100                | 450                    | 1100                  | 10-970                 | 1.6-154.2         | DN10      | 100-400V     | 630*1310          | 530            |
| EAC-Bio 600-700                 | 600                    | 700                   | 10-570                 | 2.8-161.1         | DN15      | 100-400V     | 840*1460          | 1000           |
| EAC-Bio 600-900                 | 600                    | 900                   | 10-770                 | 2.8-217.6         | DN15      | 100-400V     | 840*1460          | 1200           |
| EAC-Bio 600-1100                | 600                    | 1100                  | 10-970                 | 2.8-274.1         | DN15      | 100-400V     | 840*1460          | 1400           |
| EAC-Bio 800-700                 | 800                    | 700                   | 10-570                 | 5-286.4           | DN20      | 100-400V     | 1040*1600         | 1600           |
| EAC-Bio 800-900                 | 800                    | 900                   | 10-770                 | 5-386.8           | DN20      | 100-400V     | 1040*1600         | 1800           |
| EAC-Bio 1000-700                | 1000                   | 700                   | 10-570                 | 7.9-447.5         | DN25      | 100-400V     | 1240*1800         | 2800           |
| EAC-Bio 1200-700                | 1200                   | 700                   | 10-560                 | 11.3-633          | DN25      | 100-400V     | 1520*2000         | 4300           |
| EAC-Bio 1400-700                | 1400                   | 700                   | 10-550                 | 15.4-846.2        | DN40      | 100-400V     | 1740*2200         | 7000           |
| EAC-Bio 1600-700                | 1600                   | 700                   | 10-550                 | 20-1105.3         | DN50      | 100-400V     | 1990*2400         | 9350           |
| EAC-Bio 2000-700                | 2000                   | 700                   | 10-550                 | 31.4-1727         | DN50      | 100-400V     | 2480*3000         | 16000          |

All EAC-Bio columns have the following specifications:

- Column Material: Acrylic (316L optional)
- Pressure Rating: 4 bar
- Power Supply: Instrument compressed air, 5- 7 bar, 50NL/min

Pack-in-Place Chromatography Column (ABH-Bio)

- Designed for cGMP production, Contact materials fully comply with regulatory requirements.
- Hygienic design, no dead space.
- Good compatibility widely applicable for different resins.
- Patented distribute plate design ensuring even flow distribution through the column.
- Pack in place operated from the packing station.
- IQ /OQ documentation support.



Specification

| Product Number<br>(Item Number) | Inner Diameter<br>(mm) | Bed Volume<br>(L) | Pipeline Size | Power Supply                                      | Footprint<br>(mm) | Weight<br>(kg) |
|---------------------------------|------------------------|-------------------|---------------|---------------------------------------------------|-------------------|----------------|
| ABH-Bio-450-500                 | 450                    | 15.9-63.6         | DN10          | Instrument compressed air ,<br>5-7 bar,1000NL/min | 605*650           | 250            |
| ABH-Bio-600-500                 | 600                    | 28.3-113          | DN15          | Instrument compressed air ,<br>5-7 bar,1000NL/min | 825*900           | 480            |
| ABH-Bio-800-500                 | 800                    | 50.2-201          | DN20          | Instrument compressed air ,<br>5-7 bar,1000NL/min | 1100*1150         | 1000           |
| ABH-Bio-1000-500                | 1000                   | 78.5-314          | DN25          | Instrument compressed air ,<br>5-7 bar,1000NL/min | 1200*1240         | 1400           |

The following specifications apply to ABH Bio series:

|                       |                            |                  |                                |
|-----------------------|----------------------------|------------------|--------------------------------|
| Column Tube Material: | Acrylic/316L optional      | Bed Height:      | 100-400mm (Optional 250-600mm) |
| Column Height:        | 500mm (Optional 350-700mm) | Pressure Rating: | 4 bar                          |

Manual Screw Driven Axial Compression Column (SAC-Bio)

- Materials meeting the requirements for biopharmaceutical production processes.
- Easy to operate, easy to maintain, net pore size: 20µm (10µm optional).
- Movable top adapter.
- Hygienic design complying with cGMP requirements.



Specification

| Product Number<br>(Item Number) | Column Material | Inner Diameter<br>(mm) | Column Height<br>(mm) | Packing Height<br>(mm) | Bed Volume<br>(L) | Press ure Resistance<br>(bar) | Pipeline Size | Footprint<br>(mm) | Weight<br>(kg) |
|---------------------------------|-----------------|------------------------|-----------------------|------------------------|-------------------|-------------------------------|---------------|-------------------|----------------|
| SAC72-650                       | Glass           | 72                     | 650                   | 150-500                | 0.61-2            | 7                             | DN8           | 620*620           | 13             |
| SAC100-500                      | Glass           | 102                    | 500                   | 0-350                  | 0-2.8             | 7                             | DN8           | 620*620           | 18             |
| SAC100-750                      | Glass           | 102                    | 750                   | 200-600                | 1.6-4.9           | 7                             | DN8           | 620*620           | 20             |
| SAC100-950                      | Glass           | 102                    | 950                   | 400-800                | 3.2-6.5           | 7                             | DN8           | 620*620           | 21             |
| SAC150-500                      | Glass           | 152                    | 500                   | 0-350                  | 0-6.3             | 5                             | DN10          | 620*620           | 30             |
| SAC150-750                      | Glass           | 152                    | 750                   | 200-600                | 3.6-10.8          | 5                             | DN10          | 620*620           | 33             |
| SAC150-950                      | Glass           | 152                    | 950                   | 400-800                | 7.2-14.4          | 5                             | DN10          | 620*620           | 35             |
| SAC200-500                      | Glass           | 197                    | 500                   | 0-350                  | 0-10.6            | 5                             | DN10          | 700*700           | 36             |
| SAC200-750                      | Glass           | 197                    | 750                   | 200-600                | 6.1-18.3          | 5                             | DN10          | 700*700           | 39             |
| SAC200-950                      | Glass           | 197                    | 950                   | 400-800                | 12.2-24.4         | 5                             | DN10          | 700*700           | 42             |
| SAC300-500                      | Glass           | 297                    | 500                   | 0-350                  | 0-24.2            | 3                             | DN10          | 700*700           | 58             |
| SAC300-750                      | Glass           | 297                    | 750                   | 200-600                | 13.8-41.4         | 3                             | DN10          | 700*700           | 63             |
| SAC300-950                      | Glass           | 297                    | 950                   | 400-800                | 27.6-55.2         | 3                             | DN10          | 700*700           | 67             |
| SAC450-500                      | Acrylic         | 450                    | 500                   | 0-350                  | 0-55.6            | 3                             | DN10          | 780*780           | 230            |
| SAC450-750                      | Acrylic         | 450                    | 750                   | 200-600                | 31.8-95.4         | 3                             | DN10          | 780*780           | 250            |
| SAC450-950                      | Acrylic         | 450                    | 950                   | 400-800                | 63.6-127.2        | 3                             | DN10          | 780*780           | 270            |

\*Customized packing height & bed volume are available upon request.

# Lab-scale chromatography column (GCC)



Glass Column Tube



Easy To Assemble & Disassemble



Rotatable Column head



Multiple Models



Rotating handle



Rotating handle



Lock Design, Easy to disassemble

- Glass column tube, column position clearly visible Stigma lock design, easy to disassemble and assemble, easy to clean.
- The rotatable column head can move the screw shaft axially for packing compression.
- A variety of models with different diameters and heights are available.

## Specification

| Name         | Inner Diameter (mm) | Tube Height (mm)     | Packing Volume (ml)                        |
|--------------|---------------------|----------------------|--------------------------------------------|
| GCC 15series | 15                  | 200/400/600/800/1000 | 0-25/32-60/67-95/102-131/138-166           |
| GCC 25series | 25                  | 200/400/600/800/1000 | 0-69/88-167/187-265/285-363/383-461        |
| GCC 40series | 40                  | 200/400/600/800/1000 | 0-214/251-465/503-716/754-968/1005-1219    |
| GCC 50series | 50                  | 200/400/600/800/1000 | 0-334/393-726/785-1119/1178-1512/1571-1904 |

The following specifications apply to GCC series:

Max. Operation pressure (MPa/bar): 0.7 | 7

# Chromatography Accessories



## Sample BigLoop

- Designed for large volume of repeated sample injection in lab-scale chromatography systems.
- No contamination of samples through Internal dynamic seal structure.
- Compatible with 1/16 connector and 1/8 connector.
- 10bar Max. operating pressure.

Three specifications are available:

10<sub>mL</sub>

Bigloo10

50<sub>mL</sub>

Bigloop50

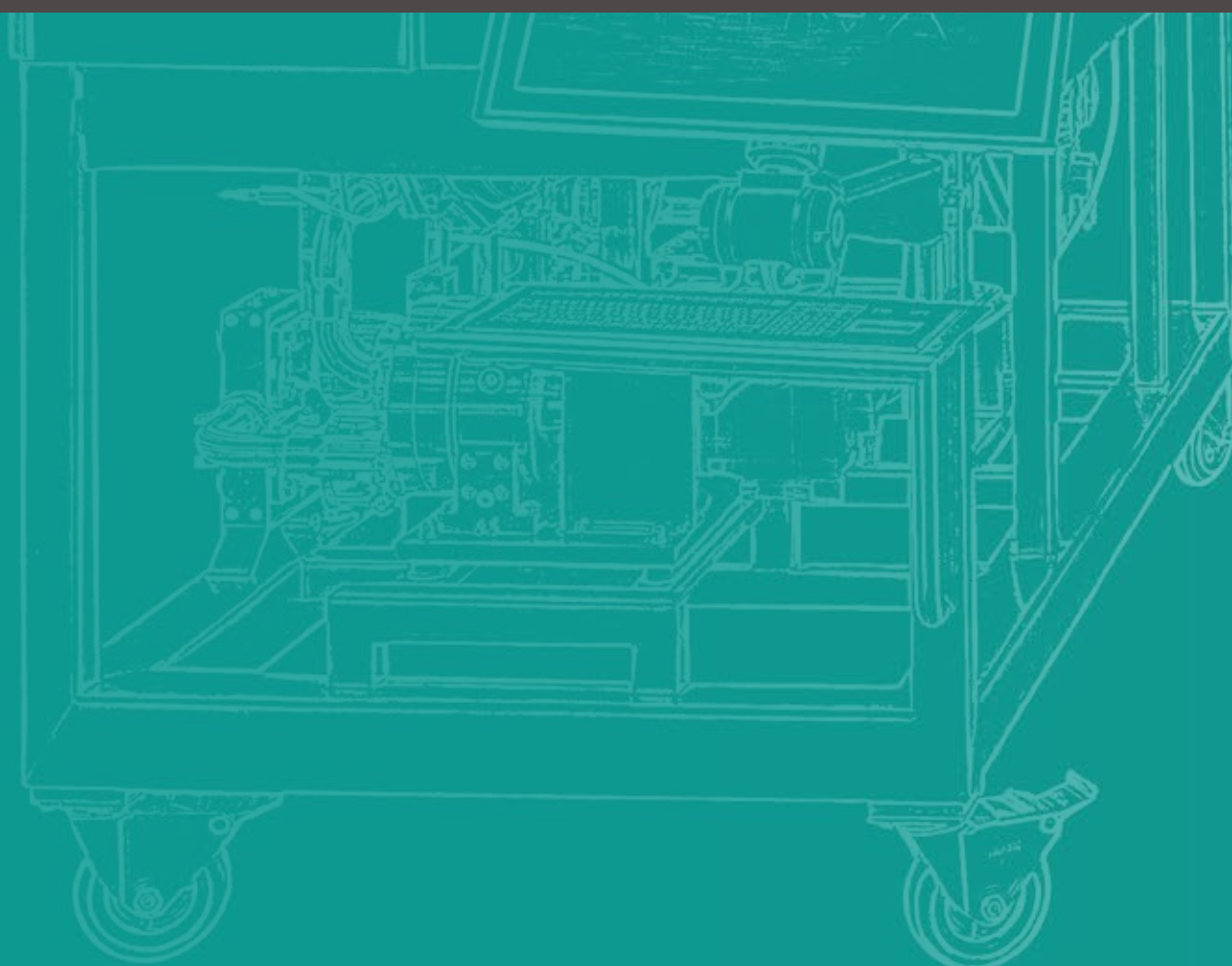
150<sub>mL</sub>

Bigloop150



## High Pressure Chromatography System & Column

PURIFICATION MADE SIMPLE.



LIPERLA/LIPERCS Preparative HPLC Chromatography System



From development to commercial phase, LIPERLA/LIPERCS Preparative HPLC Chromatography Systems are modular, compact and ergonomic systems designed for the purification of peptides, oligonucleotides, insulin and other small molecules.

- High Gradient Accuracy: The gradient has high precision and strong stability, saving time and solvent.
- Stable & Efficient: Higher separation efficiency and product yield
- Widely Use: With a wide range of system flow rates, pilot and production systems can cover DAC100~DAC1200 columns
- Safe & Reliable: The system is safe and reliable, and the LIPERCS series supports TUV ATEX explosion-proof certification.
- Multi-platform Software: The LIPERCS series software complies with the requirements of ISA88, GAMP, and FDA 21 Part11, and is optionally based on the DCS & Batch automation platform.
- Complete Verification: Complete verification services (FAT/SAT/ IQ/OQ).

Specification

| HPLC    | Model        | Flow Rate   | Operating Pressure | Ex-proof Class          | Compatible Column |
|---------|--------------|-------------|--------------------|-------------------------|-------------------|
| LIPERCS | LIPERCS DN08 | 6-180L/h    | 100bar             | ATEX II-Class Division2 | DAC100/150/200    |
|         | LIPERCS DN10 | 90-200L/h   | 100bar             | ATEX II-Class Division2 | DAC150/200/300    |
|         | LIPERCS DN15 | 150-500L/h  | 100bar             | ATEX II-Class Division2 | DAC200/300/450    |
|         | LIPERCS DN20 | 300-1000L/h | 100bar             | ATEX II-Class Division2 | DAC300/450/600    |
|         | LIPERCS DN25 | 500-2500L/h | 70bar              | ATEX II-Class Division2 | DAC800/1000/1200  |
| LIPERLA | LIPERLA 100  | 100ml/min   | 100bar             | 0-3AU                   | DAC50             |
|         | LIPERLA 300  | 300ml/min   | 100bar             | 0-3AU                   | DAC50/80/100      |
|         | LIPERLA 600  | 600ml/min   | 100bar             | 0-3AU                   | DAC80/100/150     |
|         | LIPERLA 1000 | 1000ml/min  | 100bar             | 0-3AU                   | DAC150/200        |

\* All LIPERCS & LIPERLA series systems are gradient system(PCV).

Dynamic Compression Column with precision control

Columns are the core of industrial buffer preparation chromatography separations. During the operation of DAC, the piston can provide continuous pressure to ensure the density and stability of the packed column bed, so as to maintain the best separation effect for a long time. The column efficiency and service life are much higher than that of conventional chromatographic columns.

- Using advanced structure design, simple appearance, flexible and convenient operation.
- Using precision mechanical polishing technology to minimize the tube wall effect during packing and using.
- High column efficiency and good asymmetry: For 10μm C18 packing material, the column efficiency can reach more than 40000N/m, and the asymmetry can be 0.9-1.2.
- Customized design services for products with special requirements is provided.

Specification

| Product Number | Inner Diameter (mm) | Length (mm) | Packing Height (mm) | Pressure Resistance (MPa) | Column Tube Wall Roughness | Net Pore Size |
|----------------|---------------------|-------------|---------------------|---------------------------|----------------------------|---------------|
| DAC50          | 50                  | 700         | ≤400                | 10                        | ≤0.2μm                     | 2μm           |
| DAC80          | 80                  | 700         | ≤400                | 10                        | ≤0.2μm                     | 2μm           |
| DAC100         | 100                 | 700         | ≤400                | 10                        | ≤0.2μm                     | 2μm           |
| DAC150         | 150                 | 700         | ≤400                | 10                        | ≤0.2μm                     | 2μm           |
| DAC200         | 200                 | 700         | ≤400                | 10                        | ≤0.2μm                     | 2μm           |
| DAC300         | 300                 | 700         | ≤400                | 10                        | ≤0.2μm                     | 2μm           |
| DAC450         | 450                 | 700         | ≤400                | 10                        | ≤0.2μm                     | 2μm           |
| DAC600         | 600                 | 700         | ≤400                | 10                        | ≤0.2μm                     | 2μm           |
| DAC800         | 800                 | 700         | ≤400                | 10                        | ≤0.2μm                     | 2μm           |
| DAC1000        | 1000                | 700         | ≤400                | 10                        | ≤0.2μm                     | 2μm           |
| DAC1200        | 1200                | 700         | ≤400                | 10                        | ≤0.2μm                     | 2μm           |





## Filtration System and Cassette Holder

Lisure has also been specialized in building filtration systems for both TFF and depth filtration. The systems were used in micro filtration, ultra filtration (TFF), and Nano filtration (Viral Filtration). Lisure built systems for both hollow fiber cartridge and cassette membrane. The largest system built has a membrane area of 300m<sup>2</sup> and flow rate of 60,000L/hr.

PURIFICATION MADE SIMPLE.

## Fully Automated Ultrafiltration TFF System



Flexible Configuration



Multiple Control Modes



Multiple Control Platforms



Inline Integrity Test



Water Flux Test



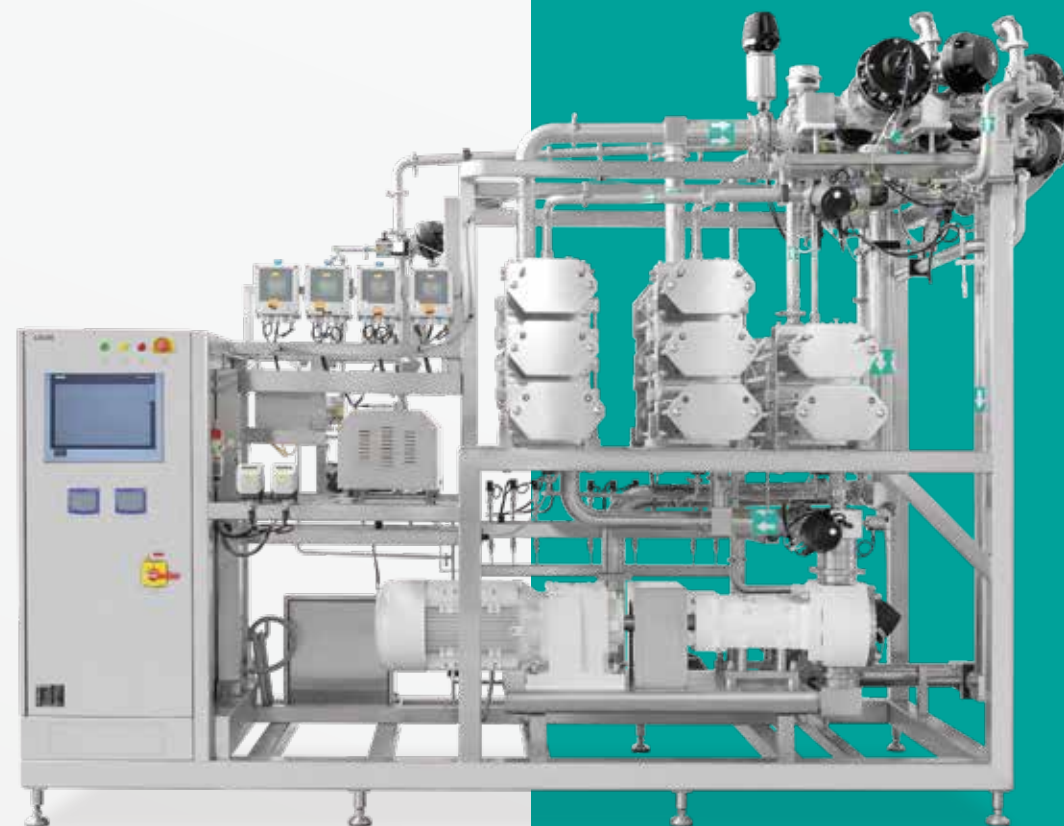
Custom Design Available

Fully automatic ultrafiltration TFF systems are designed for downstream separation and purification processes of biopharmaceuticals.

The systems can be used for concentration of buffer exchange/diafiltration in Ultrafiltration or clarification of unwanted large particles and cells in microfiltration. Our systems can be built for either cassette or hollow fiber membrane.

The systems are suitable for biopharmaceutical production at different scales and development stages, covering lab, pilot, to production scale.

The systems can be customized according to user requirements and GAMP project execution for delivery is available for customers in cGMP regulated industry.



- The filtration type can be selected flexibly according to different processes, which can adapt to the different kind of hollow fiber cartridge and flat membrane cassette, to realize ultrafiltration, concentration, buffer exchange or clarification microfiltration process.
- The control strategy includes various control modes such as constant TMP, constant Fr, constant  $\Delta P$  and fixed pump speed, covering the need for most ultrafiltration processes. Other special control strategy can be customized.
- Ultrafiltration software can be based on different platforms, such as DCS (Delta V or PCS 7) or PLC control (WinCC or Lab Windows). All control platforms meet the requirements of FDA 21 CFR Part 11 electronic signature, electronic record and audit trail requirements.
- The system includes an inline integrity test module, which can complete the integrity test without disassembling the membrane cassettes/cartridge, based on brands, models, and membrane areas. Test result can be saved in the batch report.
- The system can perform inline water flux test function, and save the result in the batch report.
- The system can be fully customized according to the plant layout and the process train to meet the customer's need.

Membrane Area:

0.1—0.5m<sup>2</sup> 0.5—3m<sup>2</sup> 0.5—5m<sup>2</sup> 5—20m<sup>2</sup> 20-40m<sup>2</sup> 40-60m<sup>2</sup> up to 300m<sup>2</sup>



## Depth Filtration System



Low  
Shear Force



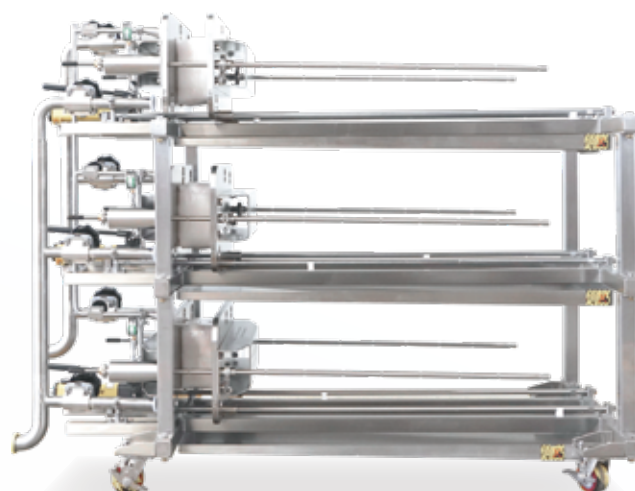
Flux  
Maximum



Reasonable  
Structure



High  
Efficiency



DFS depth filtration system is a stainless steel automatic filtration system, used in upstream or downstream production areas, for the removal of particulate matter and impurities in intermediate products.

- The system is designed to provide robust process control during the clarification/harvest step.
- Automate pre-use water rinses, product filtration and buffer rinses
- Using standard Filter or Housing, the maximum operating flow rate of the system can reach 15000L/Hr
- The system is designed to have a fully automated process, and recipe controlled steps. System start-up, product filtration and buffer tracking, all data is stored in a batch reporting system, significantly reducing the risk of disqualification and labor work.
- Human-machine interface (HMI) commands to record key process parameters.
- The system has automatic CIP function, which reduces the manual operation required for cleaning.

## Virus Removal Filtration System



Low  
Shear Force



Flux  
Maximum



Reasonable  
Structure



High  
Efficiency

The VFS Virus Filtration System is a stainless steel automatic filtration system used in downstream production areas for virus removal from the final product.



- The system is designed to provide robust process control during this critical downstream step.
- Using standard Filter or Housing, the maximum operating flow rate of the system can reach 15000L/Hr
- The system is designed to have a fully automated process through recipe controlled steps including system start-up,  $\Delta P$  values of product and filter, filtrate buffer tracking.
- All data is stored in a batch reporting system, significantly reducing disqualification and labor work.
- Configurable recipe control stages that automate pre-use system equilibration, product filtration and buffer flushing.
- To keep process parameters within limits, the process selects control functions such as flow rate, differential pressure and inlet pressure.
- Flexible configuration, compatible with all commonly used virus filters.
- Human-machine interface (HMI) commands to record key process parameters.
- The system has automatic CIP function, which reduces the manual operation required for cleaning.

## Single-Use Ultrafiltration System



Four specifications are optional: 0.5m<sup>2</sup>, 5m<sup>2</sup>, 10m<sup>2</sup>, 20m<sup>2</sup>



Circulating pump: peristaltic pump and disposable PP diaphragm pump head are optional



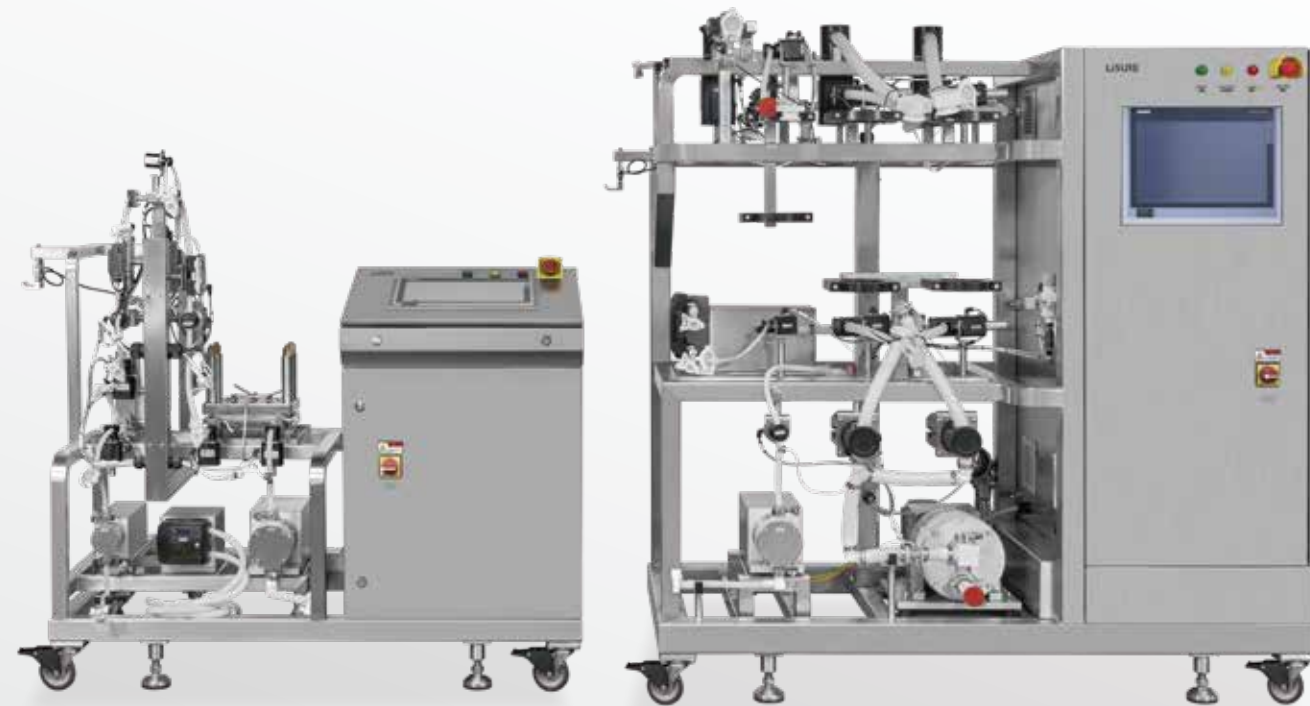
Clamping holder PP material



Disposable consumables, sterilization by Radiation



Supporting integration with mixer



## TFF Cassette Holder



Specifications: 0.1-0.5m<sup>2</sup>, 0.5-3m<sup>2</sup>, 0.5-m<sup>2</sup>-5m<sup>2</sup>, 5-20m<sup>2</sup>, 20-40m<sup>2</sup>, 30-60m<sup>2</sup>, 40-80m<sup>2</sup> and other holders covering the need from R&D to commercial production. Through combining the holders, 200m<sup>2</sup> of cassette membrane can be achieved.



Compatible with most membrane cassettes such as those from PALL, Sartorius, Millipore, TangenX, etc.



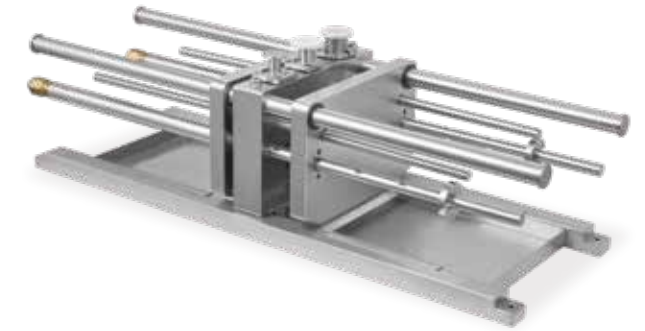
Surface roughness, Ra ≤ 0.4μm.



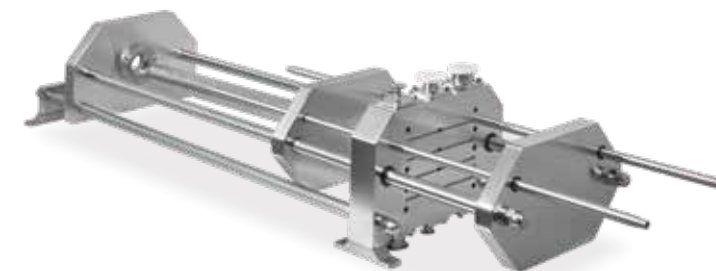
The holders can be manual or hydraulic driven.



5m<sup>2</sup>



Manual 20m<sup>2</sup>



Hydraulic Driven 20m<sup>2</sup>



## Tanks and vessels

PURIFICATION MADE SIMPLE.

## HPHS Hygienic Slurry Tank



Efficient



Gentle Mixing

Low  
Shear Force316L  
Stainless Steel

- Designed for media slurry storage, buffer exchange of the media, and stirring of the slurry during column packing of large-scale chromatography.
- Movable skid design for easy use and maintenance.
- Low shear gentle stirring to ensure uniform resin slurry.  
Tank material: 316L stainless steel.
- Sizes up to 5,000L.

## Hold Tanks / CIP



Tank bodies are manufactured LIK (Lisure's subsidiary company), which is traceable.



With pressure vessel manufacture qualification, ASME BPE qualification.



Buffer holding capability 50-20000L/h.



Material: 316L/904/titanium are optional.



Control platform: WinCC/DeltaV/PCS 7 are optional.



Sizes up to 20,000L.



