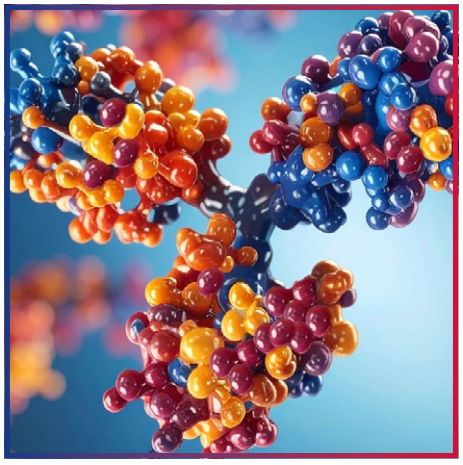
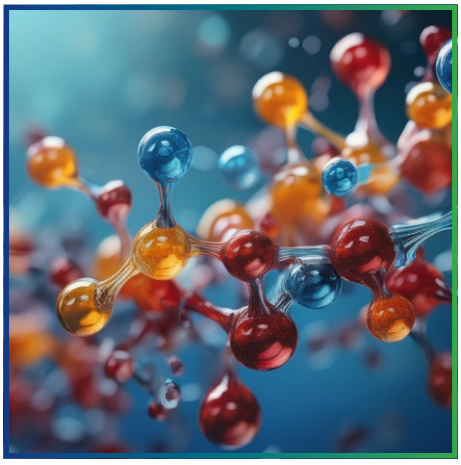
Science with Passion

KNAUER

AZURA® Purification Solutions

Flexible platforms for biomolecule and small molecule purification





Whether your challenge is purifying delicate proteins or scaling up pharmaceutical APIs, KNAUER offers the right purification technology – from lab to pilot scale.

think **LC.** think **KNAUER.**

Table of contents

Business areas

Prep HPLC solutions

Preparative HPLC – efficient purification solutions

FPLC solutions

FPLC systems – bio purification solutions

Analytical solutions

Analytical (U)HPLC and ULDC systems

SMB solutions

Simulated moving bed system solutions

LNP production

Lipid nanoparticle production

Osmometry

Freezing point osmometry

Purification chromatography

Preparative HPLC (prep HPLC) offers high-resolution purification of small molecules, Active Pharmaceutical Ingredients (APIs), natural products, peptides, and oligonucleotides. With fine-particle columns and high pressures, it ensures excellent separation performance and scalability.

Fast Protein Liquid Chromatography (FPLC) is tailored for sensitive biomolecules like proteins and nucleic acids. Operating at lower pressures with biocompatible materials, it provides gentle yet efficient purification.

Preparative chromatography is a powerful separation technique designed to isolate and purify target compounds from complex mixtures in quantities sufficient for further use, such as structural studies, biochemical assays, or pharmaceutical development.

Unlike analytical chromatography, where the focus is on detection and quantification, preparative methods prioritize yield, purity, and scalability.
Two major approaches dominate this field: **Preparative High-Performance Liquid Chromatography (Prep HPLC)** and **Fast Protein Liquid Chromatography (FPLC).**

Prep HPLC is widely applied in the purification of small molecules, natural products, and synthetic compounds. It operates under high pressures, employing columns packed with fine particles to achieve high resolution and excellent separation efficiency.

FPLC, by contrast, is typically used for the purification of biomolecules such as proteins, nucleic acids, or peptides. Operating at lower pressures and using larger particle sizes, it allows gentle handling of fragile macromolecules while still providing effective separation. With diverse stationary phases, such as ion exchange, size exclusion, and affinity columns, FPLC enables highly specific purification tailored to the biochemical properties of the target.

Together, Prep HPLC and FPLC form complementary tools in preparative chromatography, bridging the needs of both chemical and biological research by offering reliable purification strategies across a wide spectrum of molecules.

AZURA® – One platform for all your purification needs

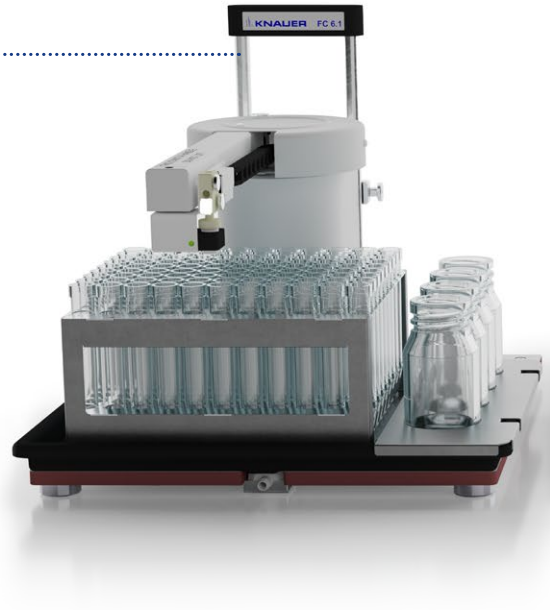
Whether you're purifying small molecules or sensitive biomolecules, AZURA offers a modular and scalable solution tailored to your workflow. Designed for both preparative HPLC and FPLC, AZURA combines flexibility, precision, and reliability – from lab to pilot scale. Benefit from customizable configurations, advanced detection options, and intuitive software to meet your purification challenges with confidence.

Detection

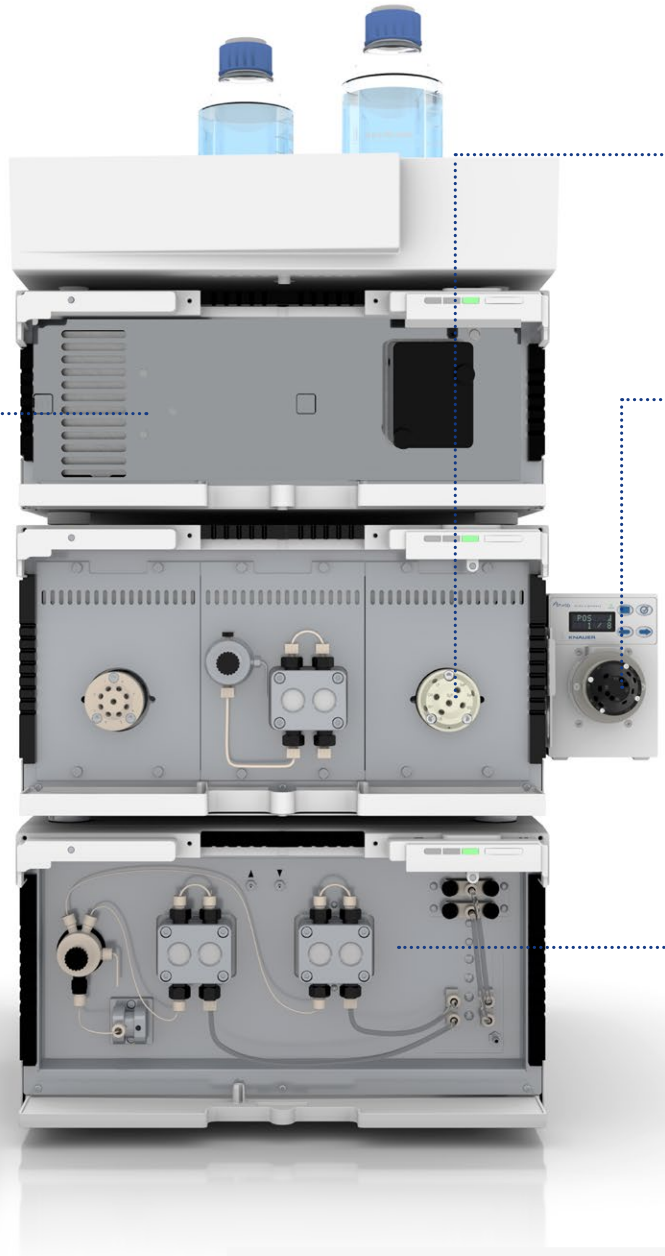
Various detector types (UV/VIS, DAD, RI, ELSD, pH, conductivity) and in-device or remote flow cells for a wide flow rate range.

Fraction collection

Fraction collectors – from affordable models for everyday applications to advanced models handling microtiter plates, large-scale collections, or high-throughput operations. Valves – for even larger fraction volumes.



Automation	
Advanced valving	Multiposition valves for eluent, sample and column selection and fraction collection enable complex workflows.
High-throughput tools	Liquid Handler LH 2.1 combines sample injection and fraction collection; repetitive injector supports multiple injections from a single vessel.
Enhanced efficiency	Features like stacked injection and automated sample injection monitored by air sensors utilize the system to its maximum capacity.
Innovative modes	Peak and solvent recycling options for cost savings and improved separation performance.
Powerful software	Highly configurable tools to automate purification workflows.



Sample injection

Valves, autosamplers, sample pumps or liquid handlers – ideal solutions for any number or volume of sample and desired level of automation.

Columns

Prepacked columns and bulk resins for reversed phase, normal phase, SEC, IEX, and affinity chromatography across the entire scale.

Add-on: temperature control

Thermal control along the flow path up to 100 °C - eluent heaters, pump head tempering, column ovens and heating sleeves for columns.

Eluent delivery

Wide range of flow rates up to 1 000 ml/min with gradient options - low-pressure (LPG) or high-pressure (HPG) gradients or isocratic gradients, eluent and buffer selection up to 12 per channel.

Scale-up & upgrades	
From lab to pilot	AZURA systems are designed for seamless upscaling, using the same modular platform and intuitive PurityChrom® software across all scales.
Flexible pump options	Exchangeable pump heads of the preparative pump enable flow rates from 1 ml/min up to 1 000 ml/min without changing the core system.
Adaptable valving	The VU 4.1 universal valve drive supports exchangeable valves, enabling flexible configurations during scale-up or system upgrades.
Variety of flow cells	A broad range of flow cells for UV/VIS and DAD detectors ensures optimal performance across different scales and applications.
Upgrade with ease	Freely combine pumps, valves, and detectors within the LC module docking station to tailor your system configuration precisely to your purification needs.

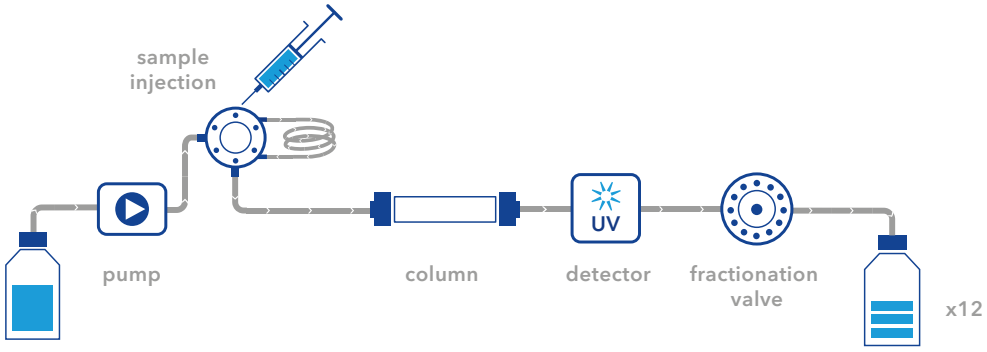
AZURA® preparative HPLC systems

AZURA preparative systems are the ideal solution for frequently changing separation tasks – from milligram to kilogram scale. Design your AZURA preparative system according to your needs and combine flexibility with reliability.

AZURA system	Eluent delivery flow /max.pressure	Sample injection	Detection	Fraction collection
AZURA Prep HPLC Compact 	Up to 50 ml/min/ 150 bar	Manual injection via loop	Variable single wavelength UV detector (190 – 500 nm)	Fraction-ation valve
AZURA Prep HPLC Lab 	Up to 50 ml/min/ 200 bar	Automated injection via loop **Optional:** via sample pump	Variable single wavelength UV detector (190 – 500 nm)	Fraction collector
AZURA Prep HPLC Pilot Basic 	Up to 220 ml/min/ 200 bar (low pressure gradient)	Automated injection via loop and system pump	Variable single wavelength UV detector (190 – 500 nm)	Fraction-ation valve
AZURA Prep HPLC Pilot Advanced 	Up to 100 ml/min / 400 bar Up to 250 ml/min / 200 bar Up to 500 ml/min / 100 bar Up to 1 000 ml/min / 50 bar	Automated injection via loop and sample pump	Variable multi wavelength UV detector (190 – 700 nm)	Fraction collector

AZURA® Prep HPLC Compact system

The AZURA Prep HPLC Compact system is the perfect introduction to preparative chromatography. With this complete semi-preparative HPLC system, you can effortlessly master your isocratic purification tasks.



Compact preparative system

One manual injection can purify several hundred milligrams at flow rates of up to 50 ml/min. Detection is performed using a versatile UV/VIS detector. The intuitive preparative software PurityChrom controls the compact system and manages fraction collection via a 12-port fractionating valve. Thanks to its compact design, the AZURA Prep HPLC Compact system fits into any laboratory.

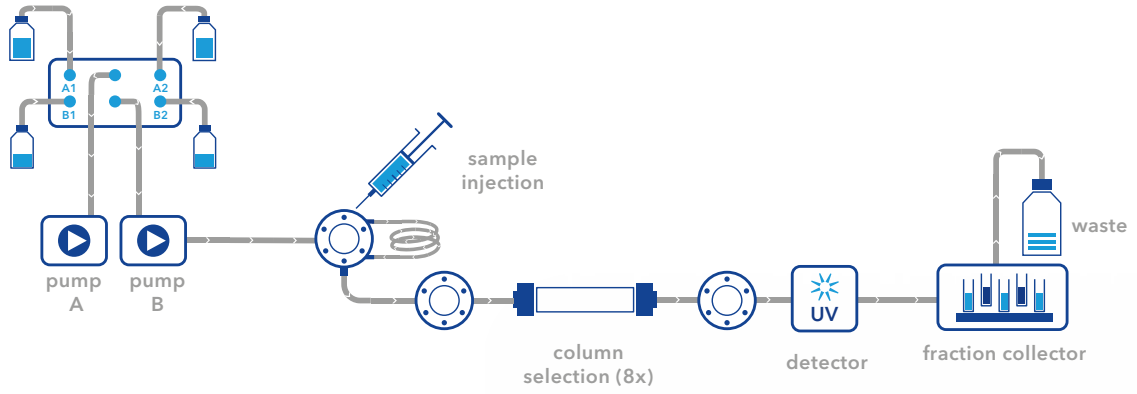
Key features:

- Complete **semi-preparative** isocratic HPLC system with **minimal space** requirements
- Injection valve incl. **500 µl sample loop**
- **UV/VIS detector** with one variable wavelength
- Intuitive **PurityChrom®** software
- **Compact** and **expandable**

AZURA Lab Prep
HPLC system

AZURA® Prep HPLC Lab system

The AZURA Prep HPLC Lab system is designed for more demanding semi-preparative separations. You can customize a highly flexible LC system using freely combinable components. With a maximum flow rate of 50 ml/min, it is possible to separate up to several hundred milligrams per run.



Key features:

- Semi-preparative HPLC system with **binary high pressure gradient**
- Injection valve incl. **2 000 µl sample loop**
- **UV/VIS** detector with one variable wavelength
- Intuitive **PurityChrom®** software
- **Fraction collector**

Popular add-ons:

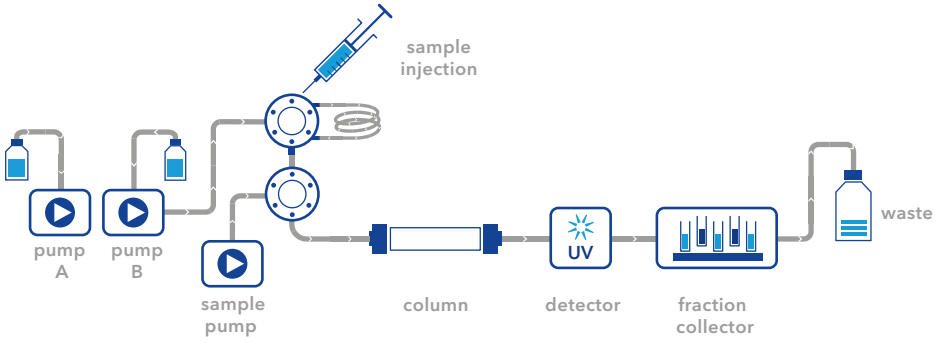
- **Sample pump** for large sample volumes
- **Column selection valve**
- **Eluent and/or column heater** for performing separations at elevated temperatures

Application note (VBS0084)

Systematic and efficient method scale-up for peptide purification
www.knauer.net/applications

AZURA® Prep HPLC Pilot system

Choose the Pilot HPLC system if you want to further increase your productivity. As with the AZURA Prep HPLC Lab system, you can freely configure your setup using modular components. Flow rates of up to 1 000 ml/min and sample loads of up to several grams are possible. Optional peak and solvent recycling can be integrated to significantly enhance separation performance and reduce operating costs.



Key features:

- Pilot Prep HPLC system with **binary high pressure gradient**
- **Sample pump**
- Injection valve
- **UV/VIS detector** with four variable wavelength
- Intuitive **PurityChrom®** software
- **Fraction collector**

LABOMATIC HD-5000 HPLC systems

The LABOMATIC HD-5000 Preparative HPLC system is an easy-to-use platform for automated sample injection when gradient elution is required for sample purification. The binary to quaternary gradient pump delivers flow rates from 5 ml/min up to 1 640 ml/min, enabling purification across a wide range of column sizes. This system is tailor-made for routine, high-throughput, laboratory-scale purification when milligram- to gram-scale amounts of sample material are available.

Max. flow pump sizes available:

- 280 ml/min
- 360 ml/min
- 570 ml/min
- 810 ml/min
- 1 640 ml/min

Dynamic Axial Compression column DAC 50

- 50 mm ID
- thermostatic jacket option

ATEX-compliant HPLC solution for GMP processes

Designed for preparative and industrial liquid chromatography (HPLC).

We customize GMP-ready preparative systems tailored to your purification task, including ATEX approval as well as FAT and SAT support.

AZURA® FPLC systems

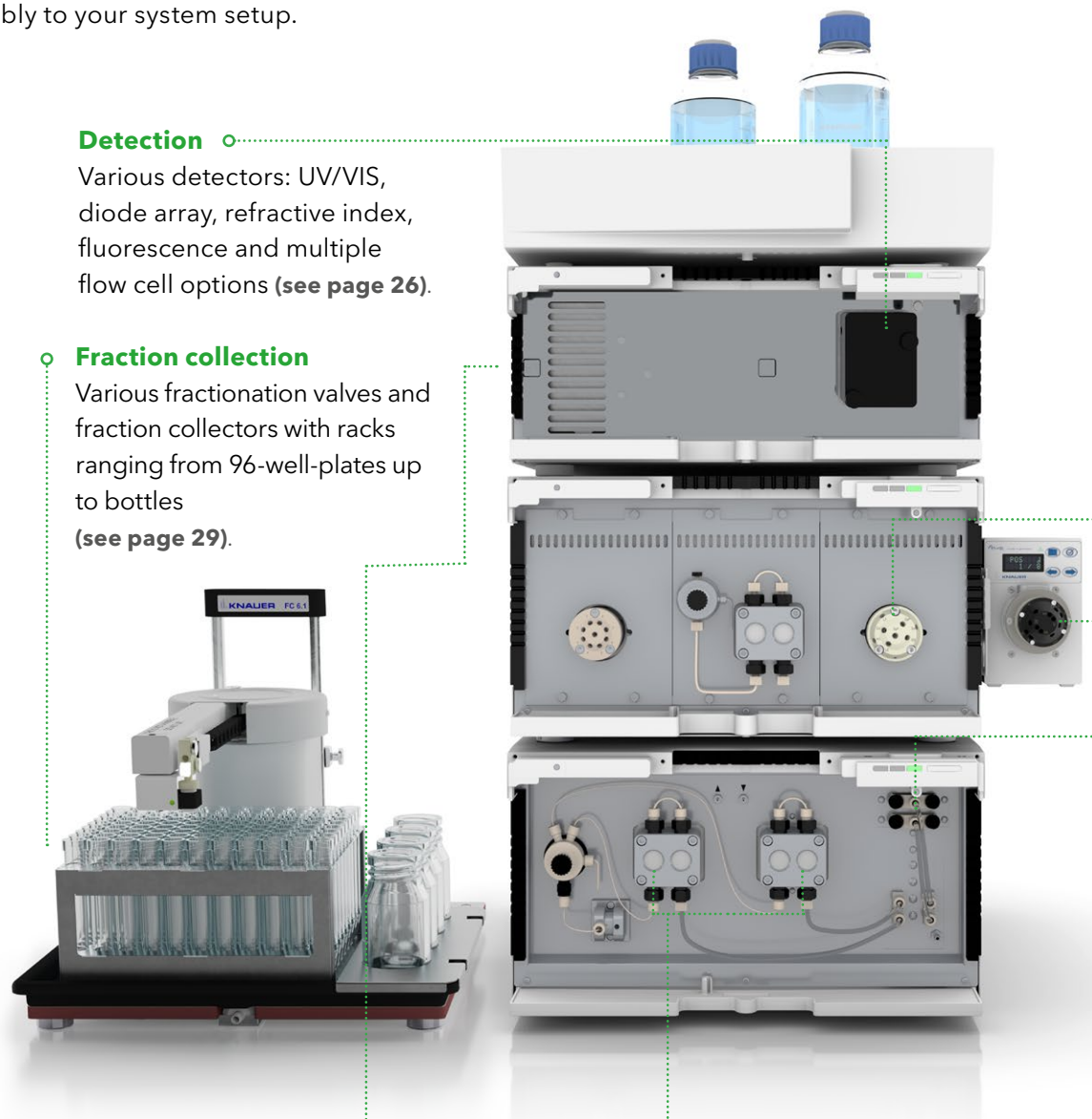
AZURA system	Eluent delivery flow /max.pressure	Sample injection	Detection	Fraction collection
AZURA Bio SEC 	Up to 10 ml/min/ 50 bar	Via loop	Variable single wavelength UV detector (190 – 500 nm)	Fraction collector
AZURA Bio AC 	Up to 50 ml/min/ 50 bar	Via system pump	Variable single wavelength UV detector (190 – 500 nm)	Fraction-ation valve
AZURA Bio Lab Basic 	Up to 50 ml/min/ 50 bar	Via loop	Variable single wavelength UV detector (190 – 500 nm)	Fraction collector
AZURA Bio Lab 	Up to 50 ml/min/ 240 bar	Automated via loop and sample pump	Variable multi wavelength UV detector (190 – 900 nm) with simultane-ous conductivity monitor	Fraction collector
AZURA Bio Lab Advanced 	Up to 50 ml/min/ 50 bar	Automated via loop and sample pump Automated storage and reinjection of sample	Variable multi wavelength UV detector (190 – 900 nm) with simultane-ous conductivity monitor	Outlet valve and fraction collector

AZURA Bio Lab
FPLC system

AZURA® Bio Lab purification system

From simple to complex, from lab to pilot scale: Design your AZURA FPLC system according to your purification task!

AZURA Bio Lab allows you to build highly flexible FPLC systems with maximum independence - simply choose your modules and configure the system yourself. The intuitive PurityChrom® software adapts flexibly to your system setup.



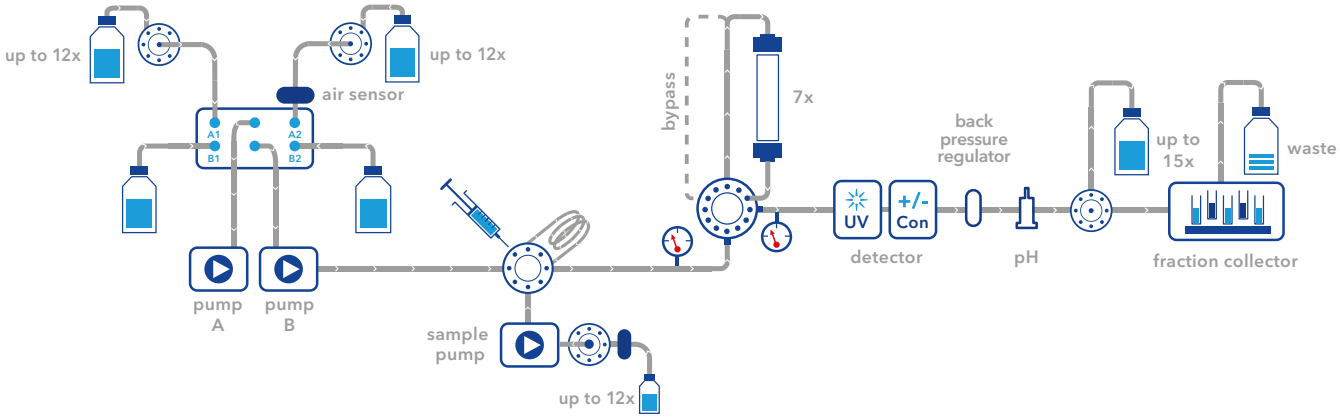
Detection
Various detectors: UV/VIS, diode array, refractive index, fluorescence and multiple flow cell options **(see page 26)**.

Fraction collection
Various fractionation valves and fraction collectors with racks ranging from 96-well-plates up to bottles
(see page 29).

Simultaneous UV and conductivity measurement
Optional pH measurement
(see page 26 (module VWD)).

Buffer delivery
Quaternary or binary pumps with flow rates up to 10 ml/min or 50 ml/min **(see page 18/19)**.

Column and loop selection valve
Choose between five columns or loops. Reverse flow possible.



BUFFER SELECTION & DELIVERY | SAMPLE INJECTION | COLUMN SELECTION | DETECTION | FRACTION COLLECTION

Intuitive PurityChrom® software
(page 35)

Sepapure® FPLC columns
(page 40)

Automate your purification
(page 32)

Injection
Manual or automated injection via loop, sample pump or auto-sampler. Sample selection valves available for up to 12 samples.

Buffer selection
Integrated buffer selection valve for 4 buffers. An additional buffer selection valve is optionally available **(see page 21)**.

All columns are supported

Cold-room operation is possible

Scale-up from lab to pilot

Choose the Pilot series if you want to further increase your productivity. Upscale your lab configuration with the same flexibility, software PurityChrom® and minimal footprint. Simply transfer and scale your methods. Flow rates up to 1 000 ml/min.
Find more information: www.knauer.net

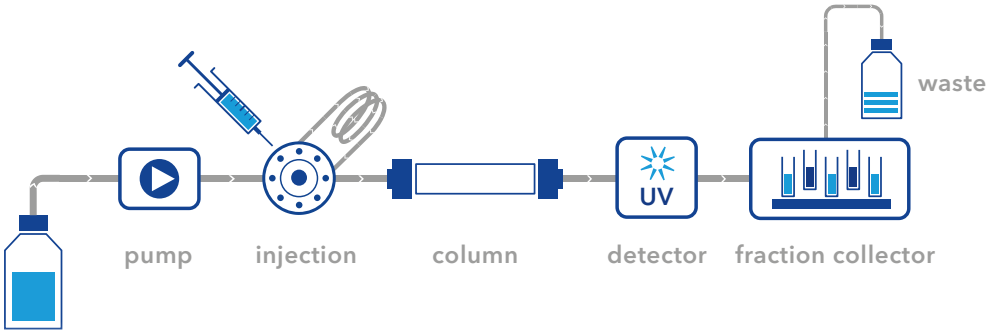
Configure your AZURA Bio purification system
Find all FPLC products on the following pages.

AZURA Bio Compact
SEC FPLC system

AZURA® Bio SEC system

Time-consuming gel filtration runs?

AZURA Compact SEC systems take over demanding SEC workflows in your lab without occupying your valuable FPLC system. Thanks to their compact design and intuitive FPLC software PurityChrom®, the systems offer outstanding performance and ease of use. Pre-designed methods tailored to the SEC system are included in the software and can be easily adapted by adjusting the column volume. AZURA Compact SEC supports all commercially available SEC columns.



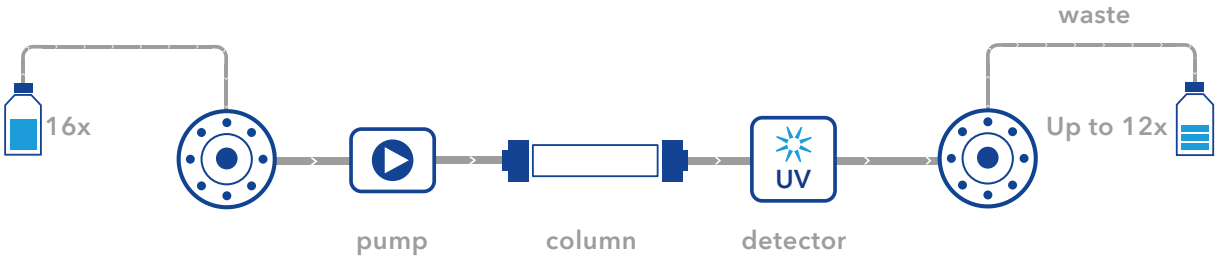
Key features:

- Flow rate: 0.001–10 ml/min; 0.1–8.0 ml/min (recommended)
- Maximum system pressure: 50 bar
- Injection valve for sample injection via sample loop
- Variable single wavelength UV-detector (190–500 nm)
- Fraction collector for fractionation
- Compatible with columns from all vendors
- PurityChrom® software

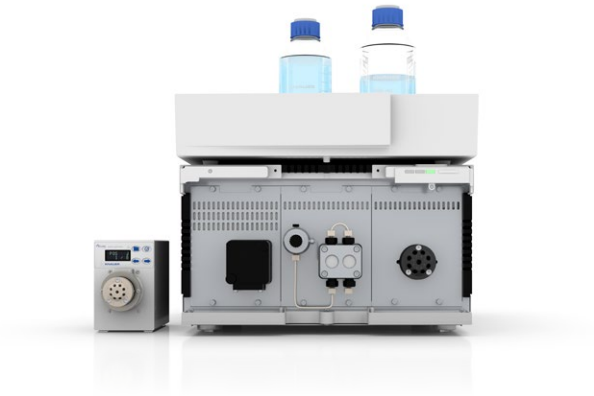
AZURA® Bio AC system

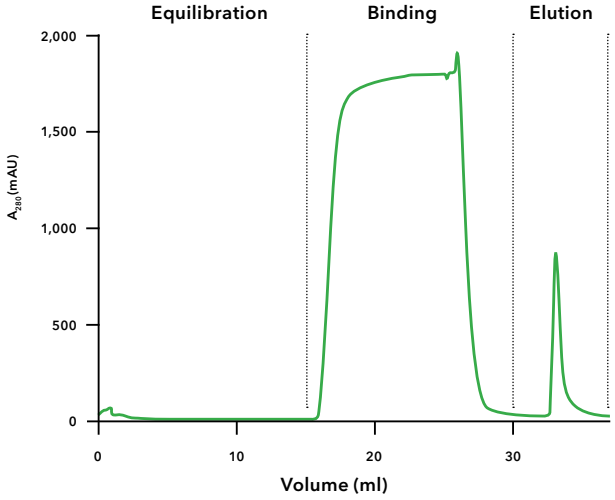
For affinity chromatography

The AZURA Compact AC system is designed for fast and reliable affinity chromatography. Select your sample, washing buffer, and elution buffer using the integrated selection valve. Your proteins of interest are detected via UV and automatically collected using the fractionation valve.



Use the selection valve for your buffers and sample.





Key features:

- Automatic sample/buffer selection valve for up to 12 buffers or samples
- Fraction valve (16 ports) for fractionation
- Flow rate: 0.01–50 ml/min; 1–40 ml/min (recommended)
- Variable single wavelength UV-detector (190–500 nm)
- Compatible with columns from all vendors PurityChrom® software
- Maximum system pressure: 50 bar

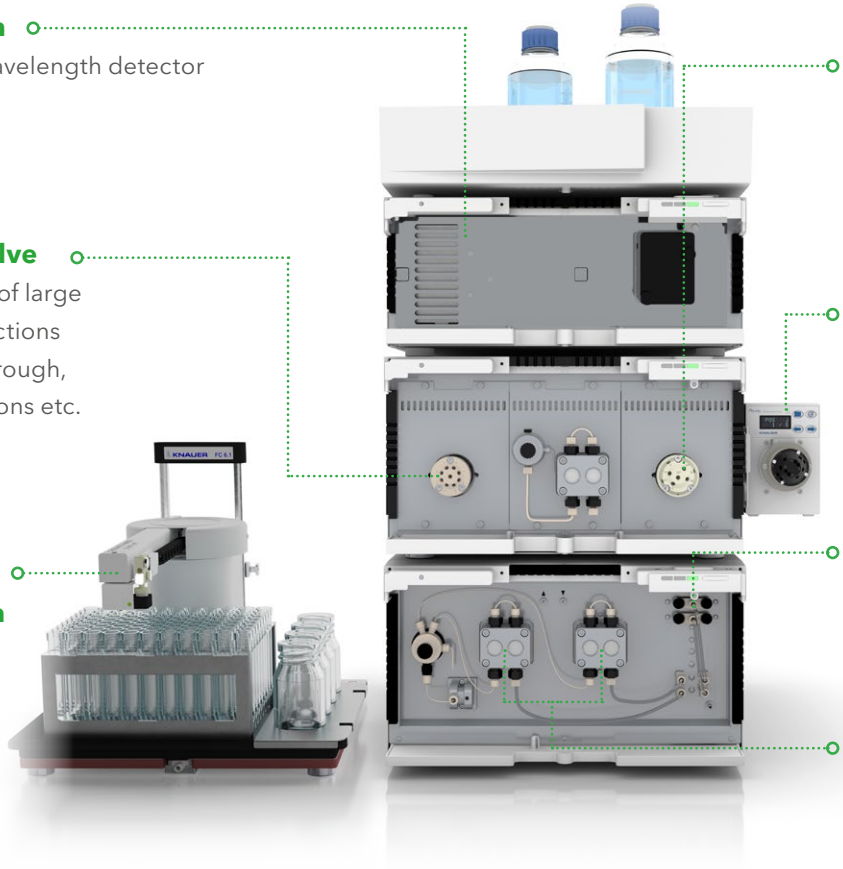
AZURA Bio Lab
Advanced system

AZURA® Bio Lab Advanced
Two-step purification

Special multi-column chromatography solutions

Protein purification typically involves two to three steps:
1. capture step
2. optional intermediate step
3. polishing step

Transitioning from one step to the next usually requires manual interaction and is therefore time-consuming. Automating these steps by combining them into a single workflow increases efficiency and optimizes the entire purification process. The fast and automated linkage of multiple chromatographic purification steps into one method eliminates manual sample handling and minimizes downtime between steps. This automation strategy can be easily adapted to any purification task.



Detection
Multiple wavelength detector

Outlet valve
Collection of large volume fractions like flow through, wash fractions etc.

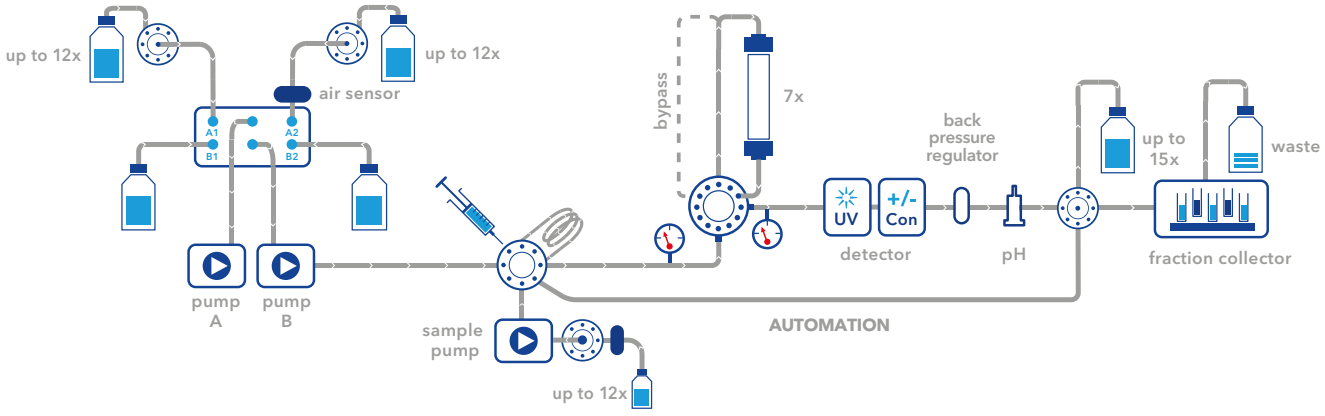
Fraction collection

Sample injection
For large and small sample volumes

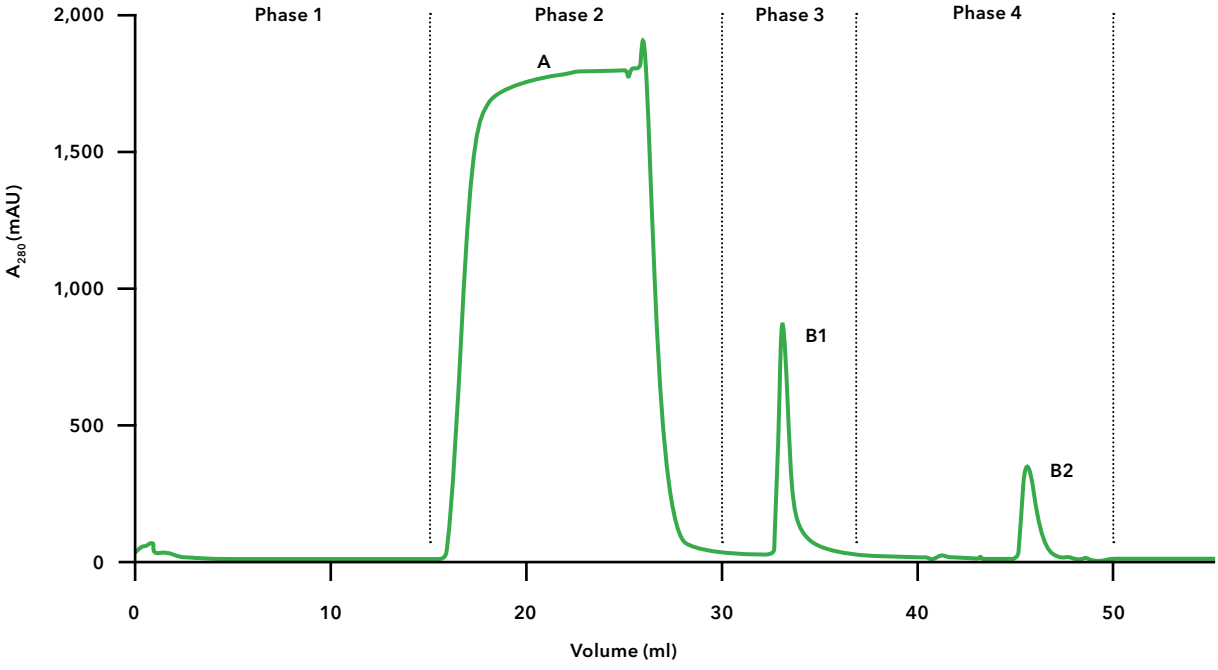
Column selection
Select between 7 columns and one bypass, reverse flow

Buffer selection
Select between 4 buffers

Buffer delivery
System pump with binary gradient



Automated two-step purification of mouse IgG antibodies



The affinity chromatography step was automatically combined with a gel filtration step to exchange the buffer of the purified mouse IgG antibodies; Phase 1: Column equilibration, Phase 2: Sample injection and washing, Phase 3: Elution of IgG from protein A column, Phase 4: Desalting of IgG

How to set up a two-step purification with PurityChrom® 6 (VTN0026)

www.knauer.net/applications

Eluent supplies
– high-precision pumps
for chromatography

AZURA® modules

The AZURA preparative line from KNAUER delivers powerful, modular LC systems designed for reliable, high-throughput purification. Smart features such as an intuitive status LED, an integrated leak sensor, and optimized internal tubing guidance ensure safe operation, minimal downtime, and maximum workflow efficiency.

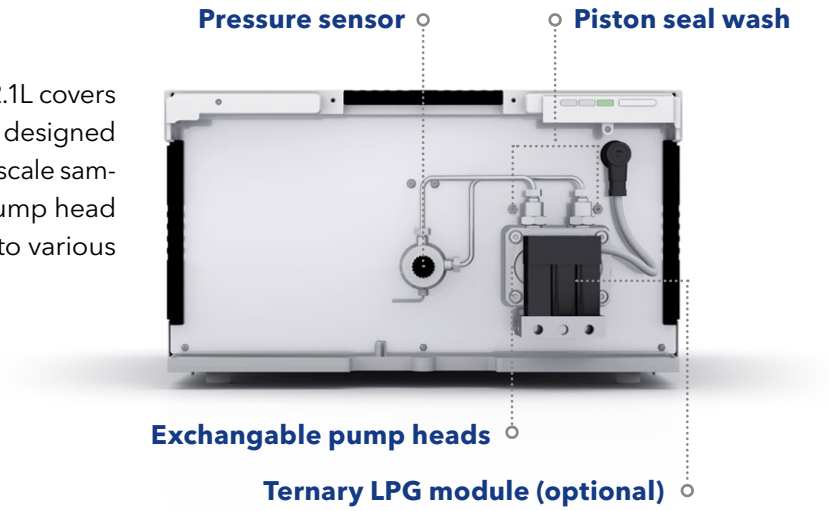
Eluent supply

Precise and reliable pumps covering a wide flow range for various gradient and solvent selection options.

AZURA pump P 2.1L

The preparative HPLC pump AZURA P 2.1L covers a wide flow rate and pressure range. It is designed for the purification of milligram- to gram-scale samples. The integrated automatic RFID pump head recognition enables quick adaptation to various applications and scales.

- **Flow rate** up to 1 000 ml/min
- Stainless steel or titanium variants
- **LPG** and **HPG** gradient options



Gradient options of pump P 2.1L

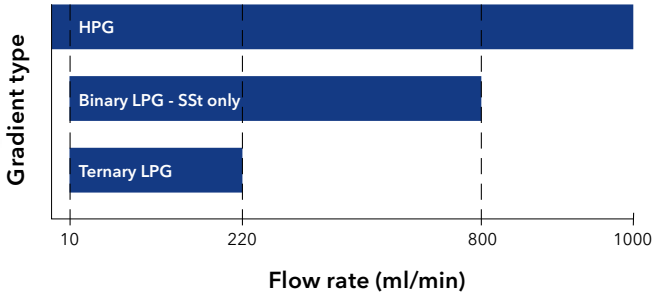
A **low pressure gradient** (LPG) module dynamically mixes the eluent on the inlet-side or low pressure side of the pump head by quickly switching between the different solvent channels.
We offer binary or ternary LPG upgrade modules for the isocratic P 2.1L.

The eluent in a binary **high pressure gradient** (HPG) system is composed by combining the solvent flows of two isocratic pumps.

Ternary LPG valve block for the pump head

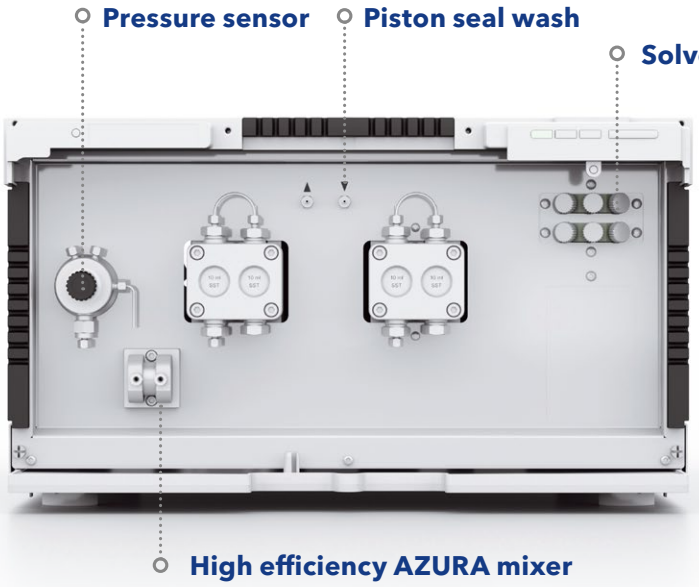
Pump head	Max. pressure	Best working conditions
100 ml	400 bar	1 – 80 ml/min
250 ml	200 bar	2.5 – 200 ml/min
500 ml	100 bar	5 – 400 ml/min
1 000 ml	50 bar	10 – 800 ml/min

Covered flow rate



AZURA® pump P 6.1L

The AZURA semi-preparative pump P 6.1L with a 50 ml pump head is available as an isocratic version or as a binary HPG pump. It is designed for medium-scale purification tasks and upscaling processes.



HPG version

- **Flow rate** up to 50 ml/min
- Best working conditions: **0.1 – 40 ml/min**
- **Binary gradient** with solvent selection valve (2x2 solvents)
- Up to **300 bar** < 10 ml/min
- Up to **200 bar** at max 50 ml/min

LPG version

Let the pump mix your buffer.

- **Flow rate** up to 10 ml/min
- Best working conditions: **0.1 – 8 ml/min**
- **Quaternary gradient** with buffer blending valve A,B,C,D
- Up to **400 bar**

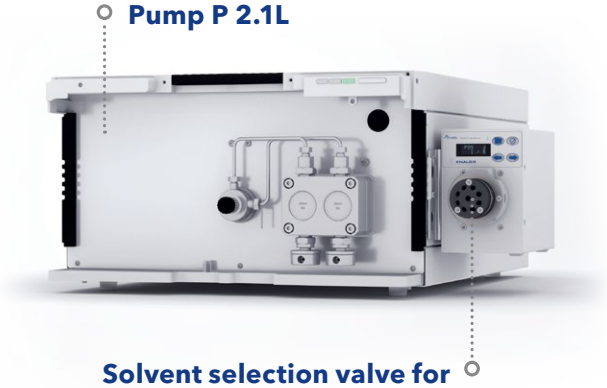
Solvent selection

For semi-preparative purification tasks, the P 6.1L pump (HPG version) includes a built-in 2×2 solvent selection valve.

For automated solvent switching, a solvent selection valve can be added to the P 2.1L pump, extending eluent selection to up to 12 buffers.

TECH TIP

> 1/8" tubing up to 80 ml/min
> 1/4" tubing up to 1 000 ml/min



LABOMATIC HD-5000 & HD-6000

With an integrated system controller for method programming and full control of the entire HPLC system. The HD-5000 controller also enables binary, ternary, or quaternary high-pressure or low-pressure gradient elution with virtually pulsation-free flow.

HD-5000

- Flow rates from 5 to 1640 ml/min
- Three-piston system with primary and secondary pistons
- Five different pump heads available, which can also be combined
- Pressures up to 600 bar (8 700 psi)
- Active piston backflushing ensures trouble-free use of buffer eluents
- Supports up to quaternary high or low pressure gradients
- Active mixing system for low pressure gradients
- Control of 12 or more pump mechanisms
- Control of up to 20 valves, static or pulsed
- Flow- or constant-pressure operation
- Programmable flow gradient
- Modifier addition with microliter accuracy (e.g., DEA/TFA)

HD-6000

- Flow rates up to 9 000 ml/min and 100 bar

Communications

- LAN
- USB
- RS-232

Pump heads	Values during continuous operation and under pressure	
	Flow range (ml/min)	**Pressure** [bar]
HDK-280	1 – 280	450 / 600
HDK-360	1 – 360	350
HDK-570	1.5 – 570	250
HDK-810	2.5 – 810	200
HDK-1640	5 – 1640	100

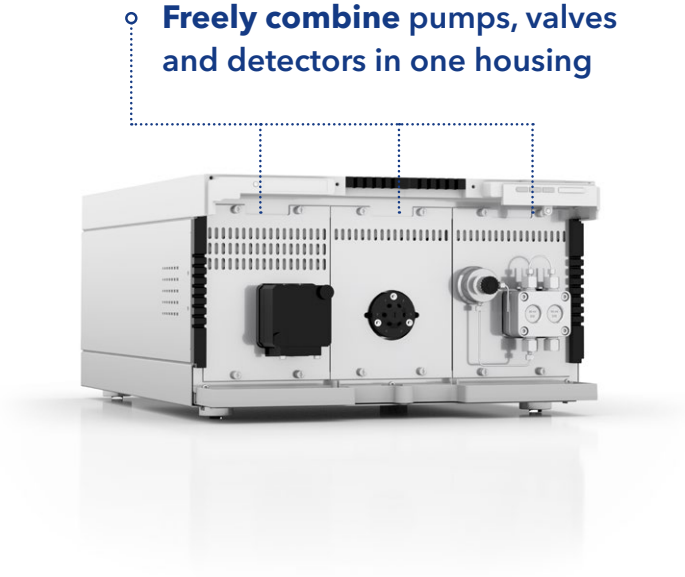
Docking station for pumps, valves and detectors

AZURA® Assistant ASM 2.2L

Whether used as a standalone solution or integrated into a larger system, the ASM 2.2L empowers users to tailor their purification workflows with precision, flexibility, and ease.

Design your ideal HPLC setup with the ASM 2.2L assistant. This modular docking station accommodates up to three compact devices, allowing you to mix and match plug-in modules such as valves, pumps, and UV detectors to suit your specific needs. Simply insert the module into the desired slot, tighten four screws – and you're ready to go.

Thanks to its user-friendly design, modules can be swapped out in minutes for maintenance or service. The system configuration can also be easily adapted to meet changing requirements. Routine tasks, like replacing a detector lamp, can be performed quickly and independently.



Pumps

Choose from 15 different pumps with 10 or 50 ml pump heads, with or without pressure sensor. The pump head materials include stainless steel, ceramic or Hastelloy C (for pumps without pressure sensors only).

Valve drive

The universal valve drive identifies valves via RFID technology and enables the reading of GLP data. All V 4.1 valves, regardless of the number of ports and position, are supported.

UV detectors

The compact single wavelength UV detector is available in a basic and a fibre-optic version. The wavelength can be set between 190 – 500 nm.

Following plug-in module combinations are not supported:

- more than two pump modules - a high pressure gradient is not supported
- more than one UV detector
- operation without plug-in modules

Sample injection

Adapt the sample injection mode to your preparative task.

Injection valve

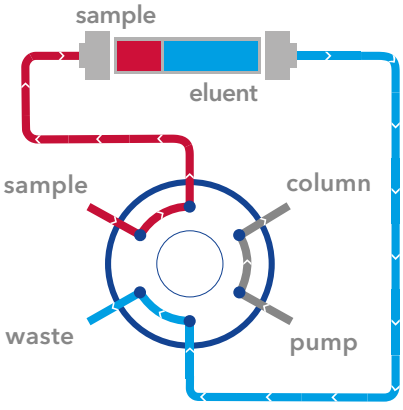
The simplest way to inject your sample into the system. Use a manual injection valve and choose from a large range of different sample loops.

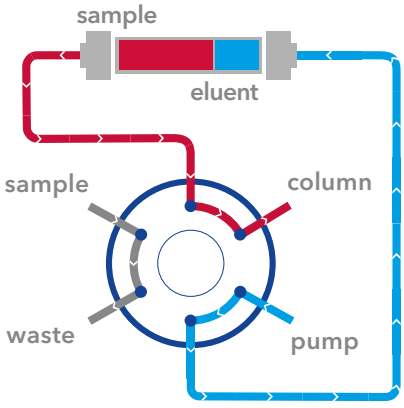
KNAUER offers several injection valves for 1/16" and 1/8" tubing. The wetted parts are made of stainless steel or PEEK to cover a broad range of applications. Injection can be done either manually via hand lever or automated with a valve drive.

The Multi-Injection valve for 1/16" tubing enables sample injection via loop and sample pump through a single valve, perfect for frequently changing applications.

VariLoop for sample injection

The KNAUER VariLoops are the perfect solution for the injection of medium to high sample volumes (up to 40 ml). The sample loop can be emptied completely or partially as well as filled completely or partially. This allows you to work very flexibly and easily switch between different sample sizes while maintaining constant and reproducible injection volumes for every sample size.





Autosamplers – efficient liquid handling for chromatography

Autosampler AS 6.1L

Sample injection can be easily automated with an autosampler. The AS 6.1L can inject up to 10 ml per injection. Sample tray temperature control from 4 – 40 °C is optionally available. It can handle either 30 samples in 10 ml vials or up to 768 samples in well plates.

Automated sample injection is also possible with the Liquid Handler LH 2.1. More information on page 33.

Dosing pumps – precise and reliable liquid handling

Sample pump

Standalone or as a plug-in module of the HPLC docking station ASM 2.2L: The compact pump AZURA P4.1S is perfect for feed injection.

More information on page 21.

- 10 and 50 ml **exchangeable pump head**
- **Flow rate** range:
  0.01 – 50 ml/min (50 ml pump head)
  0.001 – 10 ml/min (10 ml pump head)
- Pump heads available in **stainless steel** or **ceramic**
- Best working conditions:
  1 – 40 ml/min (50 ml pump head)
  0.1 – 8 ml/min (10 ml pump head)

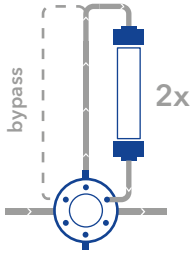
Special position valves
– control for
chromatography

Column selection

An automated selection between different columns is ideal for screening and scale-up tasks. The right valve is essential.

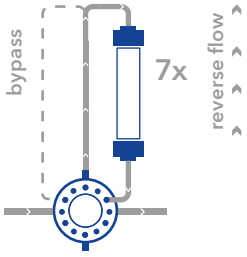
2-position valve

- Select two columns or one column and one bypass
- Flow rates up to 500 ml / min possible



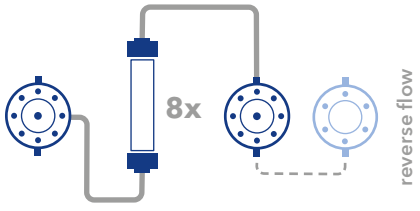
Column selection valve

- For up to 7 columns and 1 bypass
- Reverse flow
- Flow rates up to 100 ml / min



Multiple columns at high flow rates

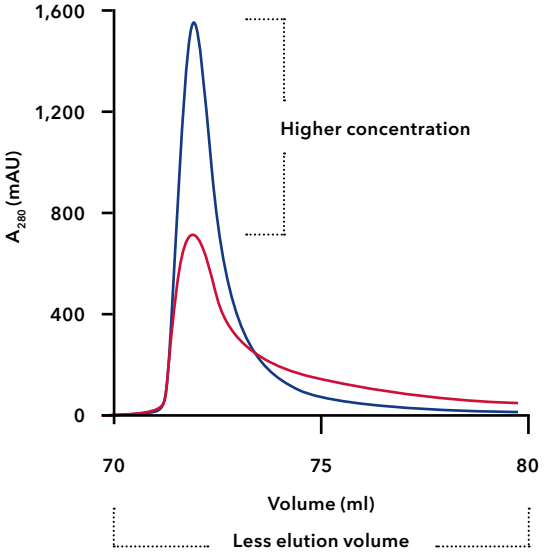
Use the column selection assistant to select eight columns ensuring a flow rate up to 500 ml/min. An additional valve allows the flow to be reversed. At lower flow rates of up to 100 ml/min, up to 16 columns can be switched using two valves.



Why is the reversed-flow option popular in affinity chromatography?

In affinity chromatography, your target molecules accumulate at the top of the column. Elution in the same direction dilutes your target molecule along the column. By elution with reversed flow, you increase the concentration while decreasing the sample volume.

The option has an additional major advantage: Clean your columns more efficiently using reversed flow. This way, you elute contaminants quickly and minimize damage to the column.



Temperature control

Increase performance. Minimize solvent viscosity.

When performing preparative LC at temperatures above 40°C in air-conditioned laboratories, e.g. in RNA or peptide purification processes, it is essential to ensure that the temperature is distributed evenly across the often huge preparative column.

Eluent and column heater

With the AZURA Eluent Heater ELH 2.1, solvent temperature can be precisely controlled using the integrated touchscreen. It supports flow rates of up to 500 ml/min for one or two eluent streams. Additionally, up to two column heating sleeves can be controlled. A cleanroom-compatible variant is also available.

Column oven

KNAUER offers a column oven for preparative columns that can heat up to 80 °C. It can accommodate up to 8 KNAUER columns with inner dimensions up to 250 × 50 mm.

Column heating sleeve

Our column heating sleeves are the perfect solution for thermostatting your preparative column hardware at temperatures up to 100 °C. Besides standard products, KNAUER also offers column heating sleeves manufactured according to your specific column hardware. There are also moisture-proof, cleanroom-compatible and autoclavable materials available.

Pump head heater

For applications in which an exact temperature is crucial for performance, tempering of the pump head is beneficial. KNAUER offers solutions to heat or cool the pump head by using a heating sleeve or a circulating water bath, respectively.

Detection

KNAUER gives you the opportunity to analyze nearly every compound due to a large portfolio of HPLC detectors. To achieve your analytical goals and to match your separation scale, our detectors are flexible in their setup, including flow cells and fiber optics. Our product line of UV/VIS detectors ranges from single variable wavelength detectors to combination detectors for simultaneous measurement of UV/VIS, conductivity and pH, and even to 8-channel diode array detectors with 3D scan capability.

NEW

Detector	UVD 2.1S	UVD 2.1L	MWD 2.1L	VWD 2.1L	DAD 2.1L	DAD 6.1L
	Compact and versatile UV detector	Reliable UV/VIS detector for a wide spectrum of applications	Robust multi-channel UV/VIS detector	Variable multi-channel UV/VIS detector. Optional measurement of conductivity and pH with one device	Versatility through a wide flow cell range	High-end diode array detector with outstanding performance
Wavelength	190–500 nm	190–750 nm	190–700 nm	190 – 900 nm	190–700 nm	190–1000 nm
Channels	1	1	4	Up to 4	8	8
3D scan					•	•
Fiber optics available	•	•	•	•	•	•
Conductivity measurement				•		
pH measurement				•		

Flow cells for UV/VIS and DAD detectors

Select from an impressive range of easily exchangeable preparative and semi-preparative flow cells for UV/VIS and DAD detectors. With capillary connections ranging from 1/16" to 1/4" and TRI-Clamp adaptors, optional fiber-optics technology and a variety of flow cell wetted materials, a wide spectrum of applications can be covered. **KNAUER´s patented CombiLight flow cells** allow the simultaneous measurement of UV/VIS, conductivity and eluent temperature.

Fiber optics technology

More flexibility

Fiber optic cables offer the possibility to separate the flow cell from the detector. This enables demanding applications such as measuring directly after a heated LC column or in hazardous environments, allowing safe operation of the instrument while maintaining performance.

Safe operation

When working at high flow rates, separation of the flow cell and the detector is a safety feature. In case of leakage, no damage to the detector occurs. Fiber optics are available in a customized length of up to 10 meters.

Flow cell with 1/4" TRI-Clamp connection

Conductivity and pH measurements

KNAUER offers different devices for monitoring conductivity and pH signals, separately or combined, for flow rate ranges up to 1 000 ml/min. With the AZURA VWD 2.1L, even a combination of UV/VIS detection with conductivity, eluent temperature and pH monitoring is possible.

Detector	VWD 2.1L (NEW)	CM 2.1S	pH 2.1S	Mikron 81
	UV/VIS detector with optional measurement of conductivity and pH	Reliable conductivity monitor with optional pH measurment	Robust pH monitor	Conductivity monitor with extremely low foot-print
Conductivity	•	•		•
pH	•	•	•	
UV/VIS	•			
Flow rate limitation	0-200 ml/min 0-500 ml/min 0-1 000 ml/min	0-10 ml/min 0-100 ml/min	0-100 ml/min 0-1 000 ml/min	0-100 ml/min 0-1 000 ml/min

Special detection

Choice of specialized detection technology, fully integrated in PurityChrom®. Suitable for preparative LC with the help of a flow splitter.

AZURA® RID 2.1L HighFlow

Preparative refractive index detector

The AZURA RID 2.1L HighFlow is a sensitive and competitively priced differential refractometer. It is suitable for detecting compounds with little or no UV activity such as alcohols, sugars, lipids or polymers in high concentrations. This instrument is designed for use in semi-preparative and preparative HPLC for flow rates up to 100 ml/min. Higher flow rates are optionally possible with a flow splitter. The intelligent temperature control guarantees fast baseline stabilization and stable operation.

Application note (VPH0068)

Cyclodextrin purification Part 2 - Method transfer and purification
www.knauer.net/applications

Light Scattering Detector Sedex LC

Sensitive universal detection with the possibility to run gradients

As a universal detector, an ELSD offers numerous possibilities for detecting substances that have few or no chromophores. Since the eluents are evaporated, the use of non-UV-compatible solvents poses no problems and the ELSD is gradient compatible.

Target analytes: Carbohydrates and similar compounds, detergents, ionic and non-ionics, artificial sweeteners, antioxidants, amino acids, lipids, peptides, polymers, pesticides, proteins, steroids.

Analog data acquisition

The KNAUER interface box IFU 2.1 LAN allows precise analog data acquisition of third party modules.

Fraction collection

Collect large quantities or large numbers of fractions

KNAUER offers different valves for fraction collection and variations of trusted fraction collectors. Whether you are doing research and development or production, there is an appropriate solution that suits your application.

Fractionation modes:
Manually – collection by direct control
Time-based – collection at defined time points
Peak-based – collection according to detector signal
Threshold function – collection according to any signal

Fraction collectors

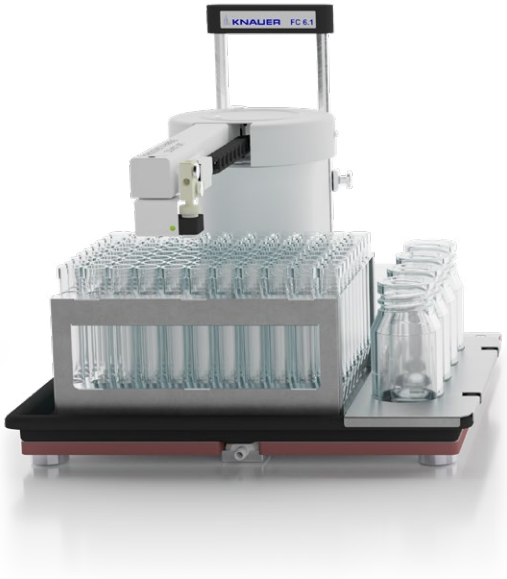
FC 6.1

The new FC 6.1 is a small, versatile, and reliable fraction collector. There are two variants available, one designed for aqueous eluents in FPLC and the other for HPLC applications. It can be used with 1/16" or 1/8" tubing for flow rates from 0.1 - 250 ml/min. With its easy-to-change drop formers, the FC 6.1 can be quickly equipped for biocompatibility. It offers space for a main rack and a small side rack, which are accessible from three sides and the top. Thanks to height adjustability, fractionation in bottles up to 1 l is also possible. The FC 6.1 can be placed on the KNAUER AZURA devices and is supported in PurityChrom® 6, Mobile Control and ClarityChrom.

Main racks for ...
165 tubes 1/1,5/2 ml each (11 mm)
99 tubes 15 ml each (17 mm)
30 tubes 50 ml each (31 mm)
8 round (72 mm) or square (65 mm) bottles 250 ml each
15 round bottles (56 mm) 100 ml each

Main racks are not included in the scope of delivery of the FC 6.1 and must be ordered separately.

Side racks for ...
4 round bottles 100 ml each
3 round/square bottles 250 ml each



LABOCOL Vario 4000 / Plus

The LABOCOL Vario 4000 fraction collectors are characterized by their high robustness and optimal ratio of size to performance. Users are not restricted to predefined rack types. Rack layouts can be configured according to individual needs. Any rack type can be integrated by defining the number of fraction vessels and their position. The wide application range makes the Vario 4000 series ideal for use in research and development as well as in production environments. A wide range of flow rates is covered by different models of the Vario 4000.

Rack type
80 tubes 18 mm / max. 36 ml
125 tubes 10.5 mm / max. 9 ml
20 tubes 36 mm / max. 140 or 240 ml
39 tubes 26 mm / max. 80 ml
24 centrifuge tubes 50 ml

Foxy® R1

The Foxy R1 fraction collector can be adapted to a broad spectrum of applications. Flow rates of up to 125 ml/min are possible. Fractions can be collected into 96 well microplates, standard tube sizes, bottles and many more. For essentially unlimited volumes, funnel racks can direct fluids to any collection vessel or downstream process. Both devices can be operated stand-alone or in the chromatography software PurityChrom®.

Rack type
144 vials 13 mm / max. 9 ml
100 vials 16 mm / max. 20 ml
36 vials 25 mm / max. 70 ml
2 microwell plates 96
60 tubes 1.5 ml
72 centrifuge tubes 15 ml
36 centrifuge tubes 50 ml
36 funnels with vinyl tubing

Fractionation is also possible with the Liquid Handler LH 2.1. For more information see page 33.

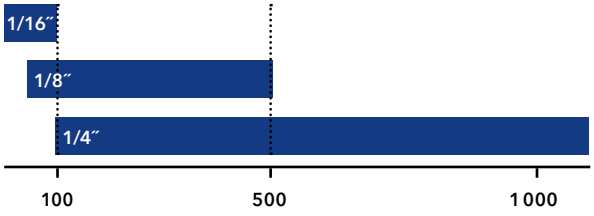
Fractionation valves

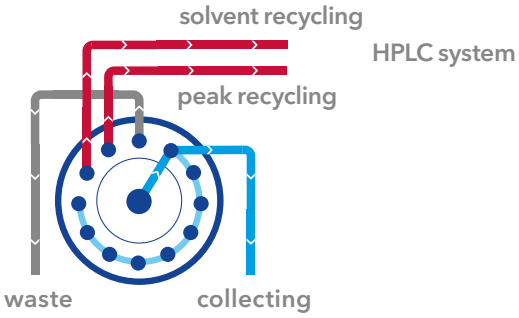
8 Port Multiposition valve
for 1/8", SST
7 fractions + waste

12 Port Multiposition valve
for 1/8", SST
11 fractions + waste

16 Port Multiposition valve
for 1/16", SST
15 fractions + waste

Fractionation valves max. flow rate (in ml/min)

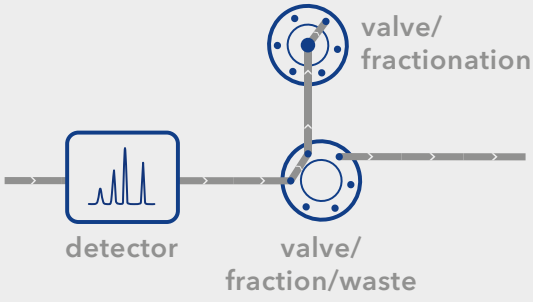




Device	Max. flow rate (ml/min) 1/16"; 1/8"; 1/4"	Racks	Different rack types	Max. fractions 1/16"; 1/8"; 1/4"
Valve	100 / 500 / 1 000			16 / 12 / 10
Foxy R1	25 / 125 / –	1	8	up to 144
Vario 4000	100 / 500 / 1 000	3	5**	72*
Vario 4000 Plus	100 / 500 / 1 000	5	5**	120*

TECH TIP

For contamination-free collection, the combination of two valves is perfect, especially as the PurityChrom software is able to address the matching delay volume for each valve.



* For 50 ml tubes; ** Device supports other racks via user-defined position setting.

Fractionation with low pressure spikes at high flow rates – the break-free valve (VTN0031)

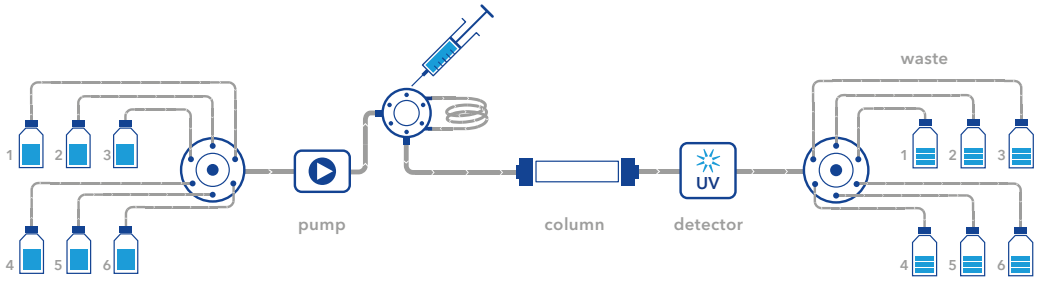
www.knauer.net/applications

Automation

Eluent selection and fractionation

When automated selection of eluents is required, up to 12 different eluents can be attached to the preparative system.

Multiposition valves fulfill many different tasks: solvent and sample selection, fractionation and column switching.



Air sensor

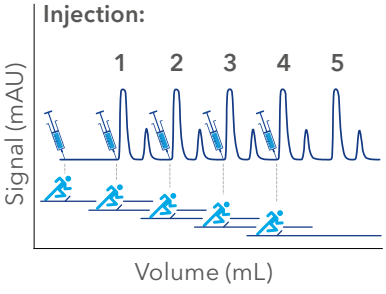
Enhance the reliability and accuracy of your HPLC system with our air sensor. Ensure optimal usage of your eluent while avoiding additional gas in your system. Our air sensors are designed to identify air bubbles and prevent interruptions before they affect your analysis, further facilitating your automated eluent selection.

PurityChrom®

With the PurityChrom software, solvent levels can also be monitored, adding an extra layer of automation to your workflow. This feature helps maintain uninterrupted operation and improves overall process reliability.

Stacked injection

With the stacked injection function, it is possible to perform multiple runs automatically, one after the other. The injection of the next run takes place during the current run, so that the time until the elution of the first peak can be fully exploited. This increases efficiency, saves time and eluent. Stacked injection can be operated with the chromatography data systems (CDS) PurityChrom® and OpenLab®.



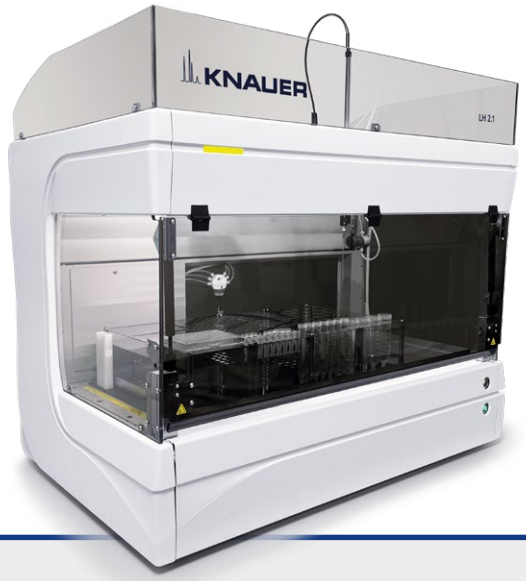
Inject, collect, repeat - stacked injection made easy
(VTN0037)

www.knauer.net/applications

Liquid Handler LH 2.1 – injector & fraction collector

KNAUER's Liquid Handler LH 2.1 allows for the expansion of purification processes with the ability to combine sample injection and fraction collection in one device. A high capacity of sample and fraction vessels meets a flexible arrangement, facilitating re-injection of samples to reach new levels of purification. The handler injects samples with minimal loss regardless of their volume – perfect for working with expensive compounds.

- **Combine** sample injection and fraction collection
- **Scalable** injection range up to 60 ml
- **Purify** from milligrams to several grams
- **Flexible** arrangement of samples and fractions via teaching option
- **Reinject** collected fractions
- **Perform** in high-throughput peptide and oligonucleotide workflows



Technical data

Fraction collection	
Fraction capacity	Maximum vessel capacity with 5 KNAUER racks • 15 x micro titer well plates • 810 x 2 ml tubes • 490 x 15 ml tubes • 160 x 50 ml tubes
Diverter valve	Yes
Number of racks	5 KNAUER racks, teaching module for all rack types

Sample injection	
Sample injection	Standard and sandwich injection mode
Sample loop	Up to 60 ml; larger loops on request
Injection valve	1/16" or 1/8" V 4.1 injection valves and VU 4.1 supported
Temperature control	No
Needle wash	Single needle wash step after each injection
Wash solvents	4
Wetted materials	Aluminium oxide 99.5 %, Borosilicate Glass, PTFE, FEP, AISI 316L, PEEK

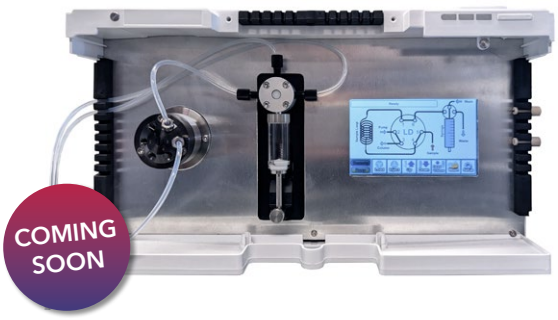
LABOMATIC Liquid Handler LH-5000

System solution from analytical to preparative applications

The state-of-the-art LH-5000 liquid handler offers customizable dimensions up to a width of 280 cm to meet your individual requirements. Work more efficiently than ever with the simultaneous execution of multiple applications. The freely programmable XYZ system provides maximum flexibility, featuring up to four Z-axes and two height-adjustable Y-axes, which can be mounted laterally on the Y-axis.
Experience maximum speed and precision while working with a variety of liquid containers – from microtiter plates to larger containers in any desired size. The removable and raised rack plates easily adapt to any container type. The LH-5000 is resistant to aggressive solvents, making it particularly durable and reliable.
Removable drip trays that catch leaks, as well as a light barrier that prevents unwanted access, provide additional safety. Flexible hose routing, with or without an energy chain, further enhances the versatility of the system.
Put your trust in a product that impresses not only with its impressive performance, but also with its adaptability and safety. Maximize your efficiency and precision in liquid handling.

Coming Soon –
Introducing KNAUER's repetitive injector

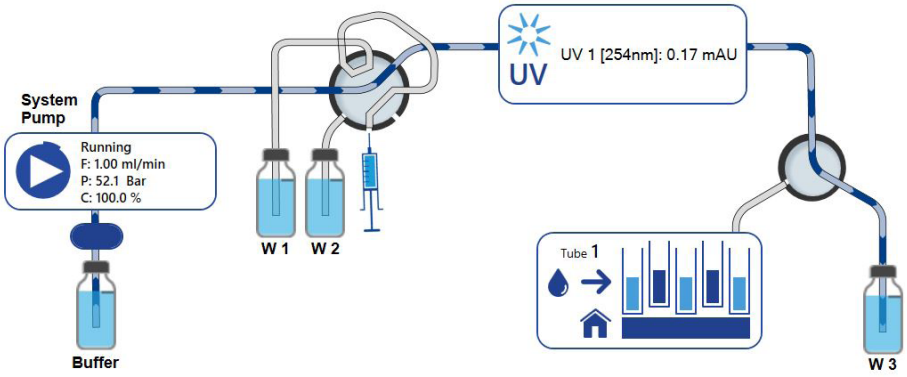
KNAUERS's new repetitive injector was designed to enhance automation in liquid chromatography applications by enabling multiple injections from a single vessel. The throughput rate of sample processing can be significantly enhanced by chaining multiple consecutive injections from a single vial, ideal for stacked injections. The flexibility of sample volumes of the repetitive injector allows usage for many different applications. User-friendly control of the device - either through manual display control or the chromatography software PurityChrom 6 - allows seamless integration of the device into new and existing HPLC systems. Through the repetitive injector, laboratories can improve their efficiency, precision and reliability of processes.



- **Automation:** Inject multiple times from a sample vessel
- **Scalability**: The volume of sample injection depends only on the loop used and can be freely configured up to 60 ml
- **Flexibility**: Parameters such as injection speed can be freely configured
- **Efficiency:** Stacked injection of larger volumes from a single sample

PurityChrom
– advanced data analysis
for chromatography

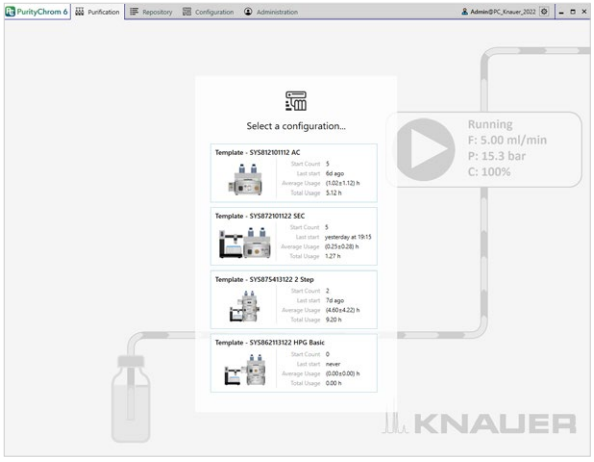
Software solutions



PurityChrom® 6

Tutorials on
YouTube
– first impression

PurityChrom is a powerful software to control your purification system. With its revised, modern user interface, new powerful features and improved usability, PurityChrom 6 is a new generation of our purification software PurityChrom. The software is developed according to GAMP 5 guidelines and is 21 CFR part 11 compliant.



Animated flow path

See exactly what you are doing and easily avoid mistakes with the animated flow path. Device functions, for example starting the pumps, setting the flow rates, switching the valves, changing the wavelength of your UV detector, are available via pop-up menus in the system visualization.

Configuration of multiple systems

PurityChrom 6 is as flexible as our KNAUER hardware. Multiple setups can be configured in the software, e.g. configure the system with heating devices and without them, for all purification tasks that do not require temperature control.

Method writing with just a couple of clicks

In PurityChrom 6, methods can be written by simply clicking in the system visualization. Furthermore, a graphical editor enables a comparison between the current method and a previous chromatogram.

Methods can be created based on volume, column volume, or time, depending on your preference. All solvent, waste and sample bottles can be configured and fill levels and solvent consumption are calculated, offering extra security during operation.

Advanced user administration

In PurityChrom 6, users can be assigned to a role, simplifying the administration of a high number of users. An audit trail summarizes all actions of all users. Additionally, each chromatogram contains a run protocol summarizing the functions and events occurring during the method.

ClarityChrom® CDS

ClarityChrom is an easy-to-use chromatography data system (CDS) for workstations. Besides support of all KNAUER devices, components and systems from more than 45 manufacturers are also supported. ClarityChrom includes the drivers for several fraction collectors and supports peak recognition by level and/or slope. The manual fraction control and the option to use the KNAUER electric valves for fractionation give you even more flexibility.

- Fraction collecting via peak recognition (level only, slope only, level AND / OR slope – incl. self-learning) or single event (unconditional, timed event)
- Easy to collect: waste, collect to position / collect to next, solvent recycling
- Direct control during a run – manually switch to: collect, waste, solvent recycling
- Consecutive runs: easily find your chromatogram by clicking on your fraction

OpenLab

OpenLAB CDS EZChrom Edition supports devices from KNAUER and many other manufacturers. The KNAUER fraction collector control option includes fractionation by time, and peak recognition by level and/or slope, also with spectral confirmation. The manual fraction control and the option to use KNAUER fractionation valves provide more flexibility. Virtual tools let you optimize fractionation from existing chromatograms without any loss of solvent or product.

Chromeleon™ 7

Chromeleon is one of the most widespread chromatography data systems. It offers a broad range of third-party drivers and can be easily used with existing HPLC systems. Chromeleon drivers for many KNAUER devices are available.

Mobile Control

The hand-held Mobile Control allows a complete overview of all devices of the AZURA systems on one screen. Remotely check important parameters or control and monitor devices. The touch-screen interface facilitates navigation using just your fingers. Choose Mobile Control as a basic, easy-to-use and cost-effective software solution! Different licenses are available depending on your needs:

- Mobile Control Display provides full access to devices. Change device settings, set operating parameters or check the system status and GLP data.
- Mobile Control Data features data acquisition of pump and detector traces in addition to full device control.
- Mobile Control FRC features a fraction collection option for simple preparative applications.
- Mobile Control LNP features a predefined method structure and ready-to-use workflow for easy formulation.

HPLC Method Converter

Easily calculate method adjustments with the KNAUER HPLC Method Converter and improve your methods for higher productivity or a greener footprint. Enter the HPLC method parameters of your original method, choose new column dimensions and particle sizes, and the software tool will automatically calculate suitable method parameters.

(U)HPLC method converter method transfer software

Accessories

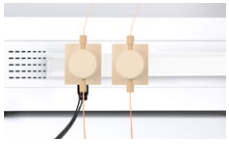
Improve system performance, organize your lab bench, and work more conveniently with the right accessories.

Accessory	Features	Benefit
Pump head inlet 	• Connect one 1/4" tube to the AZURA Pump P2.1L • Adapters for other diameters available	For high flow rates and viscous eluents
Mass flow controller 	• Unmatched accuracy at flow rates up to 833 ml/min • Compatible with PurityChrom®	Precisely monitor the eluent flow
Dynamic mixing chamber 	• Effective homogenization of eluents • For 1/16" capillaries or 1/8" capillaries	Better gradient performance
VariLoop 	• Variable injection volume and multiple injections	Adapt the sample volume to your application; repetitive injection of the same sample
Flow splitter 	• Adjustable valve for precise direct control over split ratios • Ultra low dead volume fluidic design	Collect fractions while using your preferred detection method

Accessories

Accessory	Features	Benefit
Interface box IFU 2.1 LAN 	• Highly precise analog data acquisition • 4-channel input/output • Sample rates of up to 50 Hz (one channel only)	Add any detector with analog output to your system
Air sensor 	• Detect end of buffer or end of sample with PurityChrom® • Up to 4 air sensors per system • For transparent tubing with 1/16″ or 1/8″ outer diameter	Protect columns from air damage and support automation (e.g. sample injection)
AZURA SmartClick 	• An organization tool for AZURA L systems featuring a fast variety of modules that simplifies and streamlines daily work (see page 39)	Organize your system
AZURA Benchtop Rack 	• Install AZURA systems at space-limited sites, for example in cold rooms	Space-saving solution for AZURA system setup
System skid 	• Custom fabrication of system skids according to your individual system configuration	Mobile and compact arrangement of a preparative HPLC system
AZURA L tubing guide 	• Single-sided mounting on an AZURA L device • 2 rows with 16 holes each • For 1/8″ und 1/16″ capillaries	Sort the capillaries coming from the fraction collection valve

Accessories

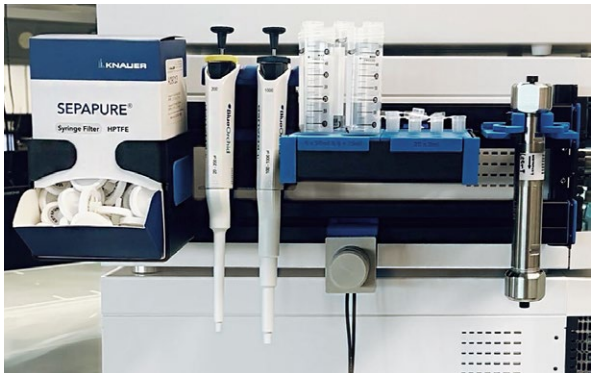
Accessory	Features	Benefit
KNAUER pulse damper 	• For pressure-sensitive FPLC columns • Reduces pulsation • Improves baseline stability • Install pulse damper after the pump	Improves performance
Pressure control 	• Monitors pressure over the column bed	Protects the column from damage
Back pressure regulator (BPR) 	• Apply a constant back pressure to your system • Freely adjustable between 1–20 bar or 20–103 bar	Prevents formation of air bubbles after the column that disturb the detector signal
pH electrode 	• Monitor the pH during your purification • Optional feature when using the VWD 2.1L or CM 2.1S	Precise control of purification processes for pH-sensitive biomolecules

AZURA® SmartClick

LC system organisation

The smart, space-saving way to organize and integrate your AZURA LC system.

The AZURA SmartClick is the innovative solution for optimising HPLC/FPLC system integration. With its modular, click-on design, SmartClick lets you attach chromatography columns, air sensors, external pressure sensors, and a wide range of accessories directly to your system – turning separate parts into a single, streamlined solution. SmartClick supports a variety of modules, including holders for laboratory vessels, small reagent bottles, pipette holders, and monitoring devices.



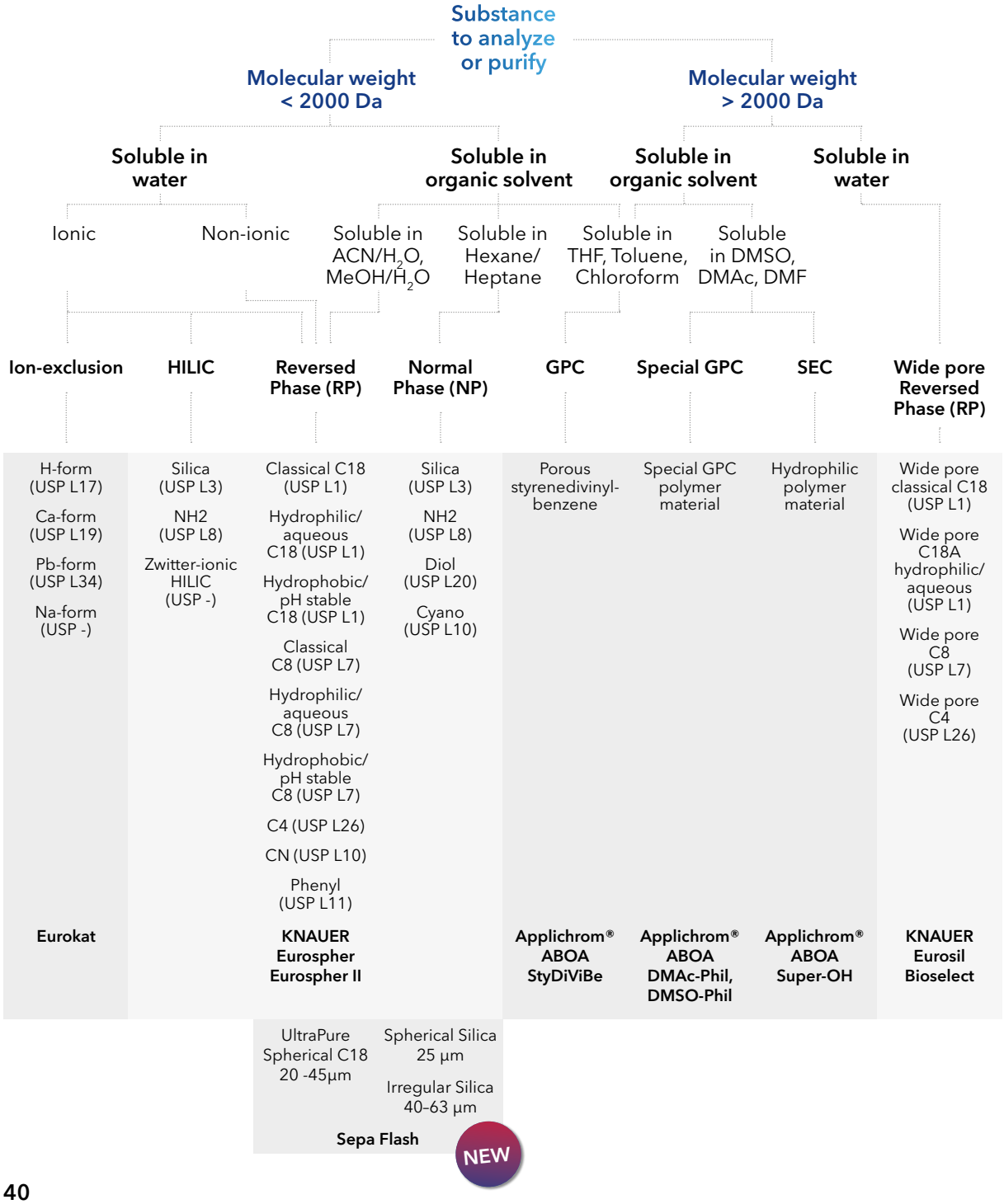
Everything you need is securely and conveniently positioned exactly where you need it, optimizing workflows, minimizing potential error sources, and enhancing safety.

KNAUER Columns

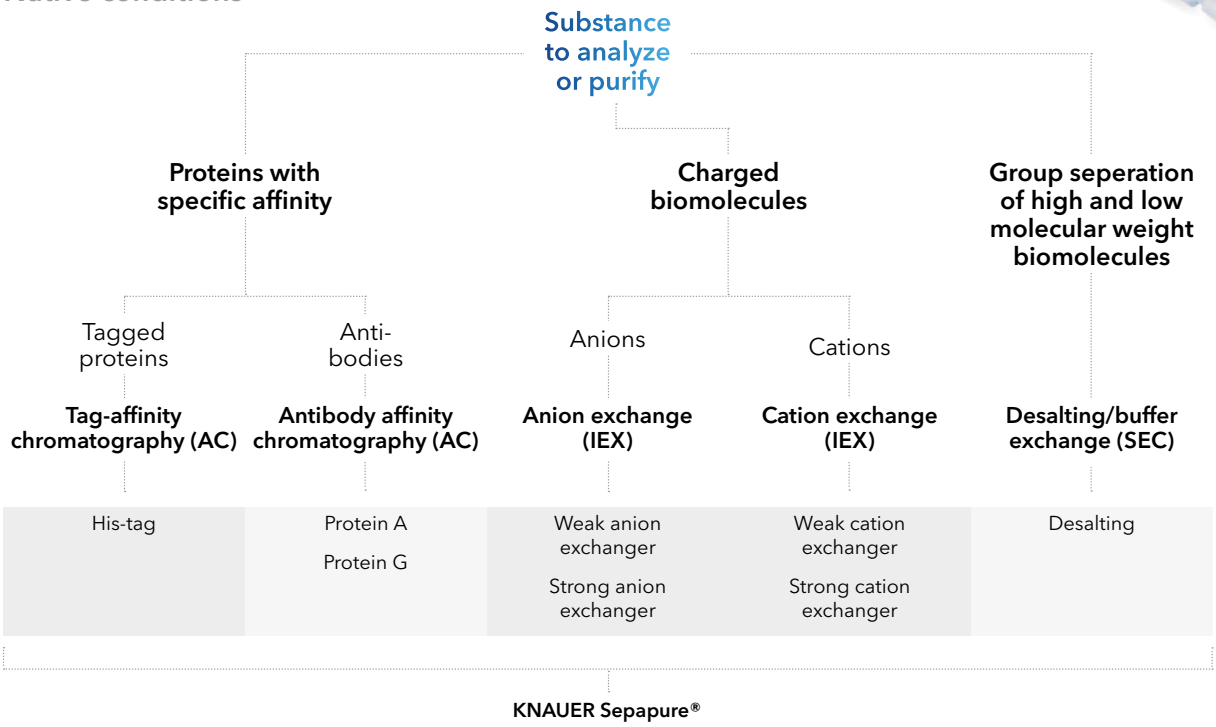
Find the perfect column from the large KNAUER portfolio.

This flow chart gives you a guideline on how to select the right column for your application. Start at the top and follow the decision lines all the way down to find a column recommendation.

Non-native conditions

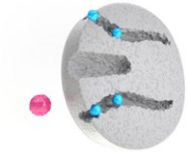


Native conditions



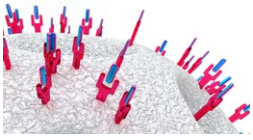
AZURA® Bio purification: You choose the method

Size Exclusion Chromatography (SEC)



Separate according to size.
See page 16 for a specialized AZURA system for SEC.

Affinity Chromatography (AC)

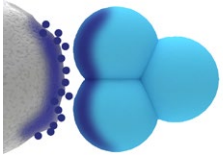


Specific binding of protein of interest.
See page 17 for a specialized AZURA system for AC.

Ion-Exchange Chromatography (IEX)

Separation takes place according to the charge of the protein and gradient elution.

Hydrophobic Interaction Chromatography (HIC)

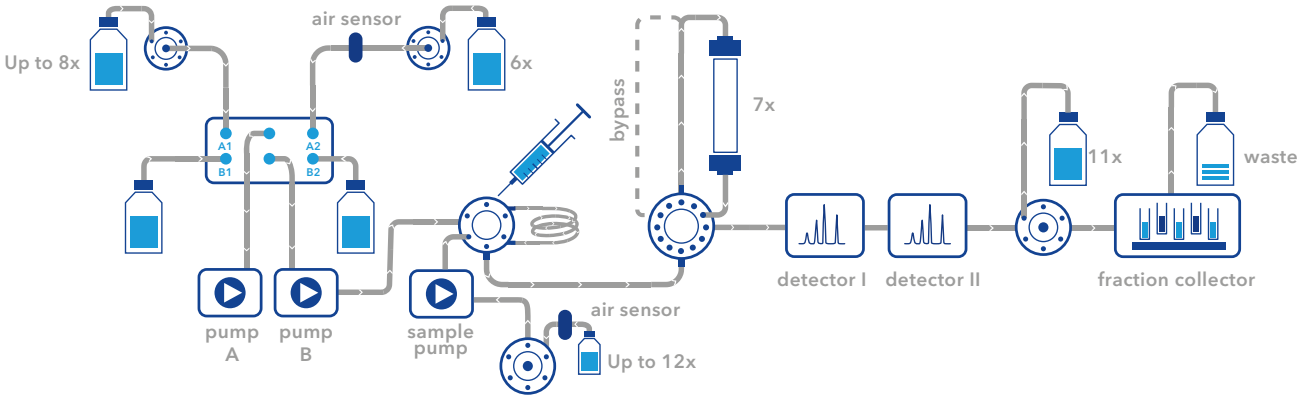


Separation is performed based on hydrophobic interaction and gradient elution.

System configurator Purification by KNAUER

MAKE YOUR PRESELECTION

☐ **Stainless steel** ☐ **Biocompatible**



SOLVENT SELECTION & DELIVERY

- ☐ 50 ml/min binary gradient pump P 6.1L
- ..... **x** 100 ml/min pump P 2.1L
- ..... **x** 250 ml/min pump P 2.1L
- ..... **x** 500 ml/min pump P 2.1L
- ..... **x** 1000 ml/min pump P 2.1L
- ☐ Ternary gradient module for pump P 2.1L
- ☐ Binary gradient module for pump P 2.1L
- ..... **x** solvent selection valve .....VU 4.1

SAMPLE INJECTION

- ☐ Multi- Injection valve
- ☐ Injection valve
- ☐ Sample pump module
- ☐ Sample selection valve: ..... **x** inlets
- ☐ Autosampler AS 6.1L
- ☐ Liquid Handler LH 2.1
- ☐ VariLoop

COLUMN SELECTION & THERMOSTAT

- ☐ Column selection (two columns or one bypass)
- ☐ Column selection high flow (7 columns, one bypass, reverse flow)
- ☐ Eluentheater ELH 2.1L for One eluent
- ☐ Two eluents
- ☐ Heating sleeve for HPLC Columns

DETECTION

- ☐ UV/VIS UVD 2.1S (single wavelength)
- ☐ UV/VIS MWD 2.1L (multiwave length)
- ☐ DAD 2.1L
- ☐ UV/VIS VWD 2.1L incl.
  - ☐ Conductivity
  - ☐ pH
- ☐ Conductivity Mikron 81
- ☐ Conductivity & pH CM 2.1S
- ☐ Refractive index RID 2.1L
- ☐ Light Scattering ELSD
- ☐ A/D-converter IFU 2.1 (integration of further detectors)

FRACTION COLLECTION

- ☐ FC 6.1 Fraction Collector
- ☐ LABOCOL fraction collector
- ☐ Vario 4000 Plus
- ☐ Liquid Handler 2.1
- ☐ Foxy R1 fraction collector
- ☐ Foxy R2 fraction collector
- ☐ Fractionation valve VU 4.1

ACCESSORIES

- ..... **x** Airsensor main pump
- ..... **x** Tubing 1/16"
- ☐ Flow splitter
- ..... **x** Tubing 1/8"
- ☐ Mass flow controller
- ..... **x** Tubing 1/4"
- ☐ AZURA SmartClick
- ☐ Backpressure Regulator
- ☐ Pressure Control (2 Pressure sensors)
- ☐ Workstation (Windows)

SOFTWARE

- ☐ ClarityChrom®
- ☐ Chromeleon™
- ☐ OpenLAB®
- ☐ Mobile Control
- ☐ PurityChrom® 6

COMMON APPLICATIONS

- ☐ Reversed phase
- ☐ Affinity Chromatography (AC)
- ☐ Size Exclusion Chromatography (SEC)
- ☐ Hydrophobic Interaction Chromatography (HIC)
- ☐ Normal phase
- ☐ Ion Exchange Chromatography (IEX)

SERVICES

- ☐ Operation Qualification
- ☐ Material Documentation
- ☐ Factory Acceptance Test (FAT)/ Site Acceptance Test (SAT)
- ☐ Software Compliance (GAMP 5/21 CFR Part 11)

Science with Passion

Worldwide partner in science since 1962

Based in Berlin, KNAUER is a medium-sized, owner-managed company that has been serving the sciences since 1962. We develop and manufacture scientific instruments of superior quality for liquid chromatography. The range includes systems and components for analytical HPLC/UHPLC, preparative HPLC, fast protein liquid chromatography (FPLC), multi-column chromatography/simulated moving bed (SMB), gel permeation chromatography/size exclusion chromatography (GPC/SEC), osmometry and skids for the production of lipid nanoparticles (LNP).

Independent and family owned

It all started with a soldering iron, a jigsaw and an ingenious idea for a highly accurate electronic thermometer.
Chemist Dr.-Ing. Herbert Knauer founded the company together with his wife Roswitha in 1962. The couple's daughter, Alexandra Knauer, is managing director and owner of the company since the year 2000. As of April 2021, she is leading KNAUER together with CEO Carsten Losch.

Today, KNAUER is an established company with about 190 employees that successfully develops, manufactures and markets chromatography instruments worldwide.

THAT'S WHAT A CUSTOMER SAYS

"At Numaferm, we use proprietary recombinant technologies to identify, optimize and produce peptides. Our customers receive peptides of the highest quality at significantly reduced production costs, being produced sustainable. As an ISO 9001:2015 certified company, reliability and customer satisfaction are our top priorities. We have been working together with KNAUER for many years and successfully use the HPLC systems for purification."

Dr. Hilke Wobst
Head Downstream Processing & Analytics, Numaferm GmbH

(U)HPLC • Prep. LC • FPLC • SMB • LNP • Osmometry

Innovation

Own hardware and software development

Customized solutions

Pumps, detectors, valves and systems adapted to your needs

Made in Germany

Independent and family-owned since 1962

Printed on recycled paper

think **LC.** think **KNAUER.**

KNAUER Wissenschaftliche Geräte GmbH
Hegauer Weg 38 • 14163 Berlin
+49 30 809727-0 • +49 30 8015010 (Fax)
info@knauer.net • www.knauer.net