

Science with Passion



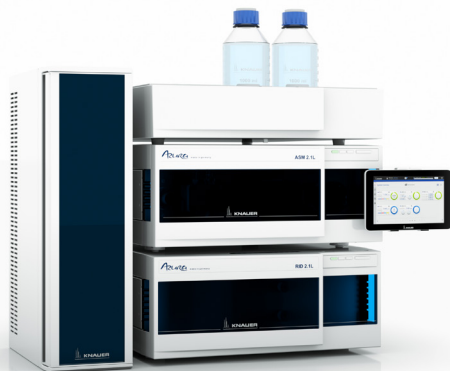
# AZURA<sup>®</sup> SEC GPC/SEC System Solutions



Robust system solutions for your  
GPC/SEC analysis and GPC cleanup.

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

# Azura®



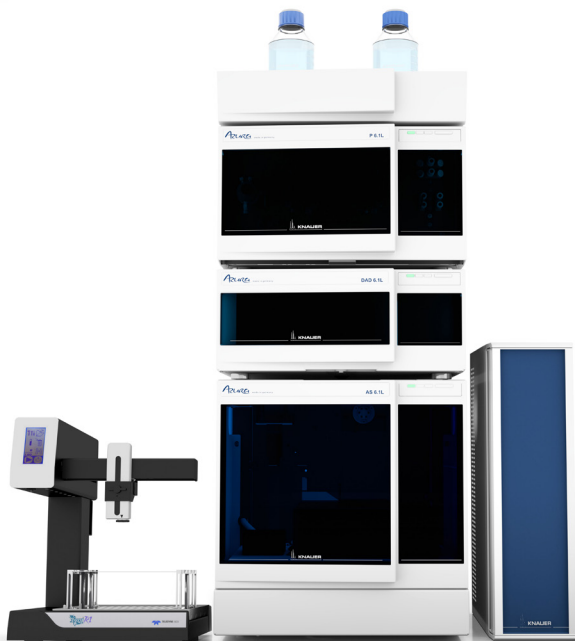
## AZURA® SEC Compact

Easy and price attractive with full analytical GPC potential



## AZURA® SEC Lab

Reliable and flexible for even the most demanding GPC separations



## AZURA® SEC Semi-prep

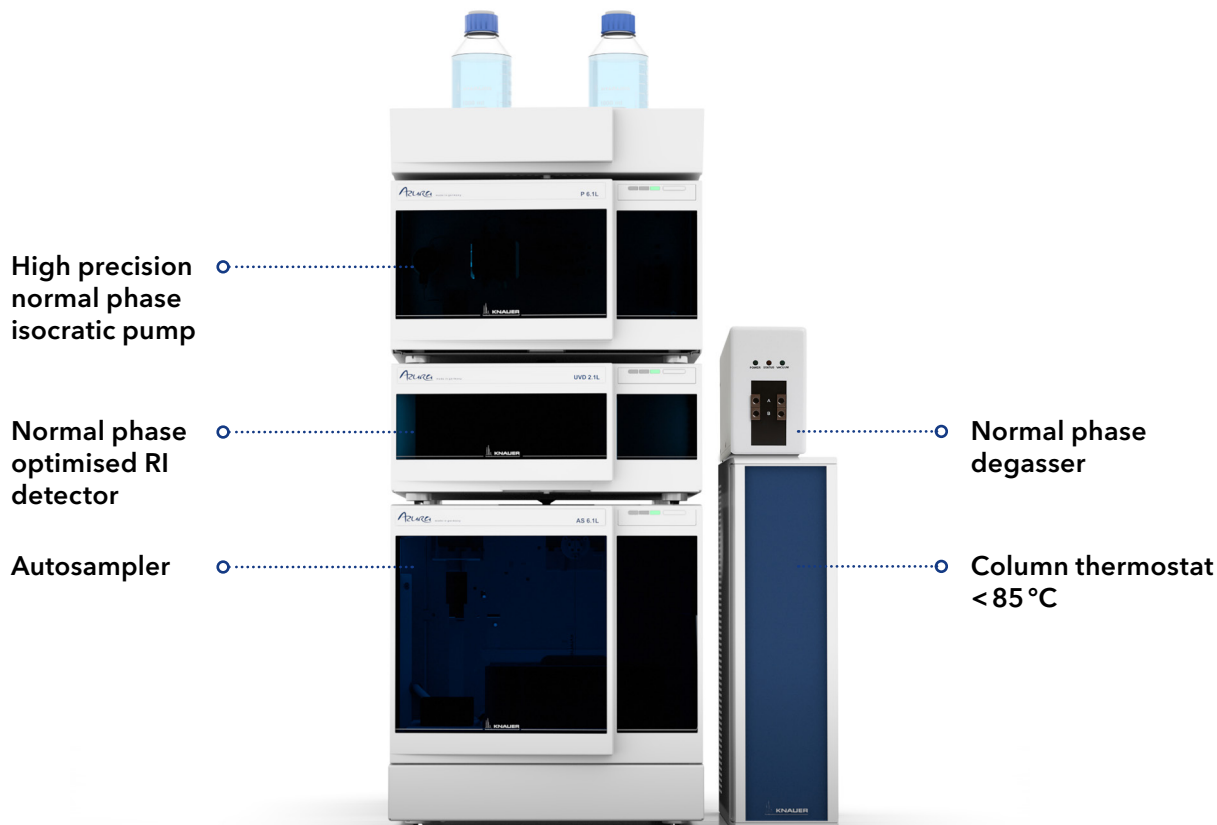
Automatic separation and fraction collection



## AZURA® GPC Cleanup

Save time with automatic sample preparation

# AZURA<sup>®</sup> SEC - Reliable and high-performing



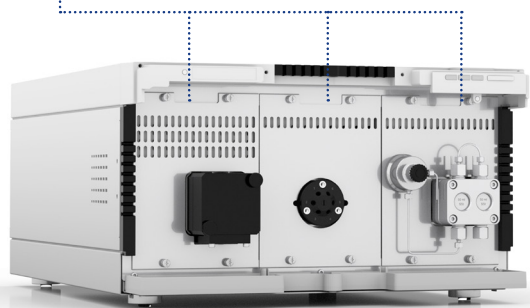
## Features

- Optimized systems for GPC/SEC applications
- Suitable for organic and aqueous solvents
- High precision dual-piston pump with extra low pulsation
- Sensitive refractive index detector optimized for low drift
- Dedicated GPC/SEC software based on ClarityChrom
- Wide range of detector types available
- Optionally available degasser suitable for organic solvents

# AZURA® SEC Compact

The AZURA SEC Compact systems offer an outstanding price-to-performance ratio and are the perfect solution for every laboratory who enter the analytical world of GPC/SEC, for process control applications or limited budget and educational laboratories.

o **Freely combine pumps, valves and detectors in one housing**



The heart of the systems is the Assistant ASM 2.2L is a docking station for three compact devices. Valves, pumps and UV detectors can be combined in one housing. Routine maintenance work e.g. replacing the lamp of a detector is easily performed by the user.

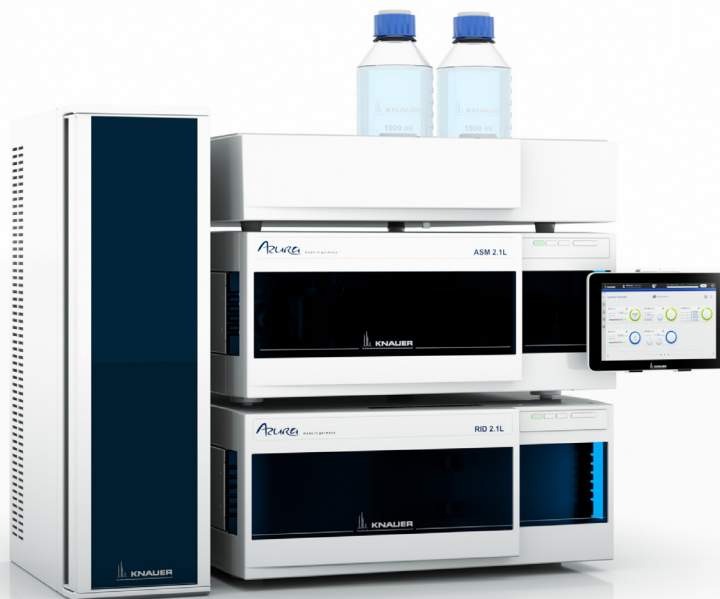
Thanks to its modular concept the systems can be extended with additional components at any time later.

## Key Features

- Flexible, easy upgradeable modular concept
- Suitable for organic and aqueous eluents
- Injection via valve drive for minimal pressure spikes
- High-performance RI detector

## Upgrade Options

- Save operating costs with an automatic solvent recycle valve
- Degasser
- Autosampler
- Detectors (RI, UV, ELSD, PDA, FLD, ECD)



# AZURA<sup>®</sup> SEC Lab

The AZURA SEC Lab systems are the perfect choice for laboratories that demands highest analytical performance. The system shows unsurpassed flow precision paired with ultra-low pulsation for outstanding retention volume precision and reproducibility.

The autosampler can inject from up to 768 positions via microtiter plates or 108 standard 1.5 ml sample vials and is therefore the perfect choice for larger sample amount as well as for high sample throughput laboratories. Thanks to the reliable and robust design it is the workhorse in any laboratory.

## Key Features

- Unsurpassed flow precision paired with ultra-low pulsation for
- Highest analytical performance
- Suitable for organic and aqueous eluents
- Highest level of automation
- Upgradeable modular concept with a large range of detectors

## Upgrade Options

- Save operating costs with an automatic solvent recycle valve
- Degasser
- Detector (RI, UV, ELSD, PDA, FLD, ECD)



# AZURA® SEC Semi-prep

The AZURA SEC Semi-prep systems offer the possibility of fractionating specific molecular weight ranges or purification tasks. The pump can deliver flow rates of up to 50 ml/min and is therefore suitable for every semi-preparative GPC/SEC columns.

Thanks to the modular concept of the AZURA platform and the dedicated PurityChrom® software the systems can be highly adapted to any separation task.

## Fraction Collection

**Collect large quantities or large numbers of fractions:**

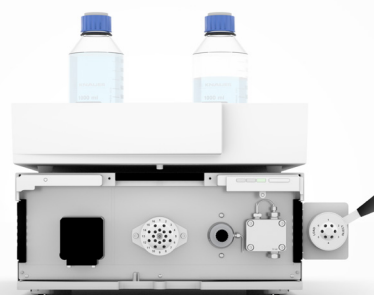
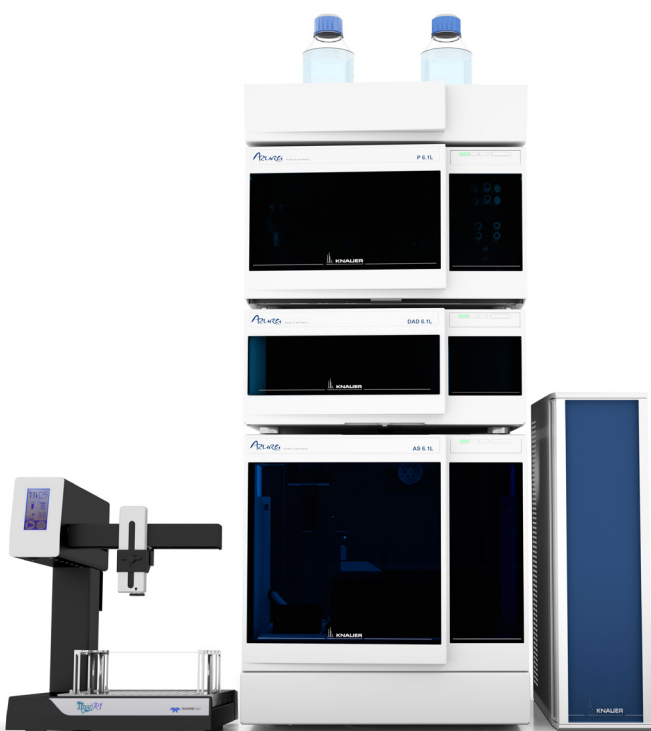
- Manually - collection by direct control
- Volume-based - collection at defined volumes
- Peak-based - collection according to detector signal
- From switching valve to fraction collector solutions

## Key Features

- Modular concept for any separation and purification task
- Flow rates up to 50 ml/min
- Autosampler with up to 10 ml injection volume
- Suitable for organic and aqueous eluents
- Manual sample injection or autosampler
- Single or multiple fraction possibilities
- Save operating costs with an automatic solvent recycle valve

## Available Detectors for Semi-prep

The AZURA SEC Semi-prep systems can be equipped with a dedicated high-flow RI detector that can be used up to 10 ml/min as well as with the UV Detectors UVD 2.1S and UVD 2.1L.



# AZURA® GPC Cleanup

Do not waste time and labor with manual sample preparation. The AZURA GPC Cleanup system automates work-intensive and time-consuming cleanup tasks based on gel permeation chromatography (GPC). Further, reproducibility and quality of the cleanup are improved.

## Key Features

- Automated workflow for higher laboratory efficiency
- Outstanding reproducibility
- Better optimizable of cleanup tasks
- Easy adaptable for different applications

After sample loading, the dedicated system fully automated processes up to 15 samples while requiring minimal bench space. Based on the versatile AZURA device platform the system can be customized to fulfill individual requirements. The cost-effective software Mobile Control provides a touch-optimized user interface for intuitive device control directly at the system.

## In accordance with established methods to determine pesticide residues

- Method 984.21 – AOAC international
- EPA SW-846 Method 3640A – US Environmental Protection Agency
- AEN 12393 and EN 1528 – European Standard
- L 00.00-34 Method in accordance with §64 LFGB (formerly § 35 LMBG)

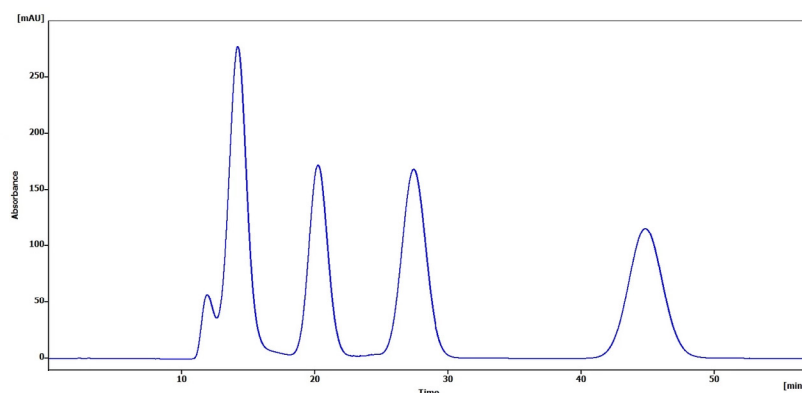


Fig. 1 Chromatogram of US EPA method 3640A calibration standard containing 1) Corn oil matrix 2) Bis-(2-ethylhexyl)phalate 3) Methoxychlor 4) Perylene



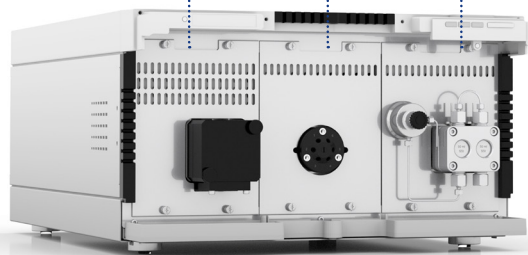
# System Components

## Pumps

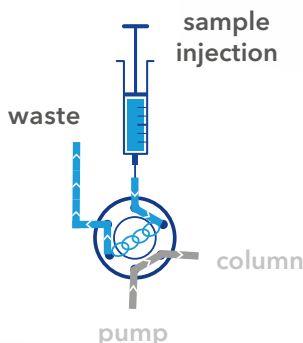
KNAUER LC pumps are well-known for their reliable, high precision solvent delivery that is directly translated into outstanding retention time precision and reproducibility. They are optimized for the use of organic and aqueous solvents thus cover the whole range of GPC/SEC applications. Choose between a full pump module or a compact plug-in device.



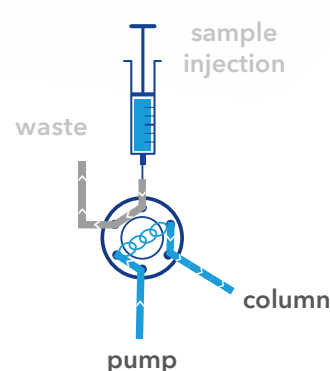
Freely combine pumps, valves and detectors in one housing



Load position

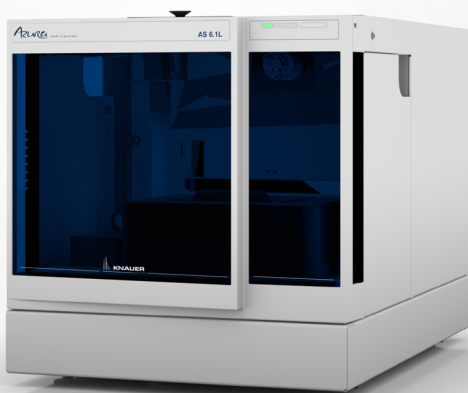


Inject position



## Autosampler and Sample Injection Valves

The high-precision AZURA Autosampler AS 6.1L is the perfect choice for larger numbers of samples and high-throughput requirements. This autosampler can inject from up to 768 positions (microtiter plates) or 108 standard 2 ml sample vials.



KNAUER offers a wide range of sample injection products. The most cost-effective solutions are the manual injection valves. Minimize injection pressure spikes through fast switching times, when using motor-driven valves.



## Column Compartment

The AZURA CT 2.1 is a forced air column thermostat capable of heating or cooling from 5 to 85 °C. The powerful fan and robust peltier element keep the column at a very stable temperature, thus allowing reproducible analysis results. The Compartment has space for up to 6 columns with maximum 300 mm length, depending the column outer diameter.

Wide space,  
easy handling

Up to 6 columns  
with maximum  
300 mm length

Columns up to  
16 mm ID

Cooling and  
heating from  
5-85 °C



## Detectors

The AZURA RID 2.1L Refractive Index detector is the perfect choice for any GPC/SEC system. Thanks to the intelligently designed optical unit with advanced temperature control it ensures high sensitivity, fast baseline stabilization, and excellent reproducibility. Furthermore, the long-life LED, highly pressure resistant flow cell, improved

safety features and enhanced diagnostics functions guarantee outstanding reliability and minimal maintenance. The wide linear dynamic range, its low internal volume of 43 µl from the inlet to the flow cell make the AZURA RID 2.1L the perfect choice for any GPC/SEC application.

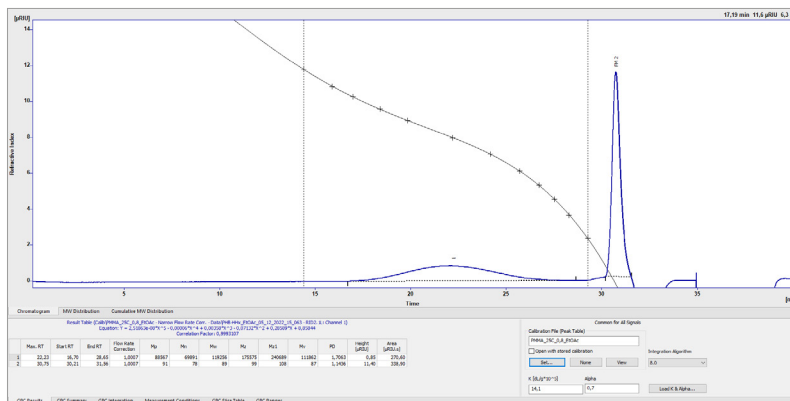
### **KNAUER also offers a large detector portfolio with:**

- Various UV detectors, with singlewavelength, multi-wavelength and diode-array models
- Fluorescence detectors (FLD)
- Evaporative light scattering detectors (ELSD)
- Electrochemical detectors (ECD)
- Conductivity detectors

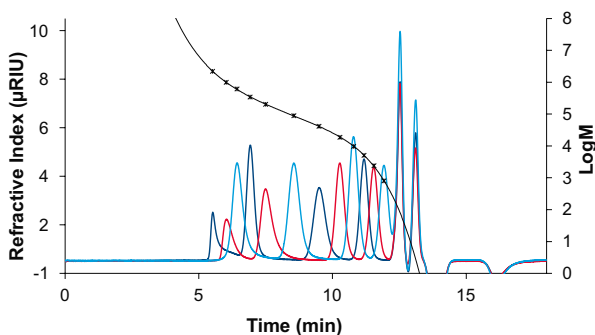


## Software

ClarityChrom® is a modern, easy-to-use chromatography data system for workstations. Combined with the GPC/SEC control module and extension it offers an interactive and automated analysis. It includes re-calibration, reporting that simplifies the retrieval of GPC data. It further features flow rate and multi detector delay corrections as well as narrow, broad and broad-on-narrow calibrations.



Chromatogram of polyhydroxybutyrate (PHB) sample, 12-point PMMA calibration in ethylacetate (EtOAc), fit function of 5th degree



12-point PMMA calibration in EtOAc

PurityChrom® is a preparative chromatography software that is suitable for any GPC/SEC-related purification tasks. Due to its high flexibility, methods can be developed according to specific demands. It includes intuitive data evaluation with peak recognition and integration as well as with the freedom of creating methods based on column volume or time. PurityChrom supports the modular concept of KNAUER AZURA and thus comes as an expandable solution.

## Columns

KNAUER offers a wide range of high-quality GPC/SEC columns, made in Germany by AppliChrom. With its outstanding resolution due to the high pore volume, they are perfect for any routine tasks as well as for challenging applications. The proprietary column packing procedure together with the tight quality control ensures a highest level of reproducibility, column for column, batch to batch and year after year.



**SuperOH** - e.g., biopolymers and aqueous polymers

**StyDiViBe** - e.g., wide range of polymers using THF, toluene, chloroform

**DMAc-Phil** - e.g., PMMA, PAN, cellulose, and polymers soluble in DMF or DMAc

**DMSO-Phil** - e.g., starch, UF/MUF-resins, polysaccharides, PNIPA

**CatPhil** - e.g., polycations, polyamines, polyethylenoxides, Polysaccharides, and Polyanions

# Application Areas

## Polymer Industry



- Synthetic polymers (PVC, PS, PEG, etc.)
- Biodegradable synthetic polymers
- Biopolymers, natural polymers
- Engineering polymers
- Resins
- Elastomers
- Waxes
- Polymers for 3D printers
- Polymer recycling
- Polymer research

## Food & Beverage



- Sugars and polysaccharides
- Polymeric food additives (colorants, antioxidants, non-nutritive sweeteners, non-nutritive hydrocolloids, texture and mouthfeel modifiers, etc.)
- Food supplements (binders, coatings, disintegrants, etc.)
- Pesticides

## Adhesives



- Bio-based
- Synthetic

## Colors



- Paints
- Inks
- Coatings

## Sample Applications



Size exclusion chromatography of polylactic acid in three different solvents



Characterization of fructans in fermentation products with GPC/SEC



Analysis of Poly [(R)-3-hydroxybutyric acid] in chloroform using GPC and universal calibration



GPC cleanup of olive oil samples

# Technical Data

## AZURA SEC Compact

<b>Mobile phase delivery principle</b>	Serial dual-piston pump
<b>Flow rate range</b>	0.001–10 ml/min
<b>Flow rate increment</b>	0.001
<b>Max. delivery pressure [MPa]</b>	40 MPa
<b>Flow rate accuracy</b>	± 2% (5–50% of flow range using ethanol/water 10:90)
<b>Flow rate precision</b>	≤ 0.5 % RSD (measured at 1 ml/min using ethanol/water 10:90)
<b>Sample injection method</b>	via valve drive, manual loading
<b>Injection volume range</b>	1 µl–5 ml depending on sample loop

## AZURA SEC Lab

<b>Mobile phase delivery principle</b>	Serial dual-piston pump
<b>Flow rate range</b>	0.001–10 ml/min
<b>Flow rate increment</b>	0.001
<b>Max. delivery pressure [MPa]</b>	86 MPa
<b>Flow rate accuracy</b>	± 0.25% (5–80 % of flow range, using ethanol)
<b>Flow rate precision</b>	≤ 0.04 % RSD or 0.008 min SD (whichever is greater)
<b>Sample injection method</b>	via autosampler
<b>Sample injection volume range</b>	0.1 µl–5 ml depending on sample loop (default 100 µl)
<b>Number of samples processed</b>	up to 768 via microtiter plates or 108 standard 2 ml sample vials

### AZURA SEC Semi-Prep

<b>Mobile phase delivery principle</b>	Serial dual-piston pump
<b>Flow rate range</b>	0.01–50 ml/min
<b>Flow rate increment</b>	0.01 ml/min
<b>Max. delivery pressure [MPa]</b>	15 MPa
<b>Flow rate accuracy</b>	± 2% (5–50 % of flow range using ethanol/water 10:90)
<b>Flow rate precision</b>	≤ 0.5 % RSD (measured at 5 ml/min using ethanol/water 10:90)
<b>Sample injection method</b>	via valve drive, manual loading
<b>Injection volume range</b>	1 µl–5 ml depending on sample loop

### AZURA CT 2.1 Column thermostat

<b>Columns temperature range</b>	5–85 °C
<b>Columns temperature accuracy</b>	± 0.2 °C
<b>Columns temperature precision</b>	± 0.1 °C

### AZURA RID 2.1L Refractive index detector

<b>Linearity</b>	> 1000 µRIU
<b>Drift</b>	0.2 µRIU/h
<b>Noise</b>	± 2.5 nRIU
<b>Max. flow rate</b>	10 ml/min (pure water)
<b>Flow cell volume</b>	15 µl
<b>Temperature control</b>	OFF, 30–55 °C (1 °C increment)

## Technical Data

AZURA RID 2.1L HighFlow Refractive index detector	
<b>Linearity</b>	> 4000 $\mu$ RIU
<b>Drift</b>	2.0 $\mu$ RIU/h
<b>Noise</b>	$\pm$ 50 nRIU
<b>Max. flow rate</b>	100 ml/min (pure water)
<b>Flow cell volume</b>	9 $\mu$ l
<b>Temperature control</b>	OFF, 30-55 °C (1 °C increment)

AZURA UVD 2.1L	
<b>Wavelength range</b>	190-750 nm
<b>Wavelength accuracy</b>	$\pm$ 2.5 nm
<b>Noise</b>	$\pm$ 15 $\mu$ AU at 254 nm (ASTM E1657-98)
<b>Drift</b>	300 $\mu$ AU/h at 254 nm (ASTM E1657-98)
<b>Linearity</b>	> 2.0 AU at 274 nm (ASTM E1657-98)

AZURA UVD 2.1S	
<b>Wavelength range</b>	190-500 nm
<b>Wavelength accuracy</b>	$\pm$ 3.0 nm
<b>Noise</b>	$\pm$ 20 $\mu$ AU at 254 nm (ASTM E1657-98)
<b>Drift</b>	300 $\mu$ AU/h at 254 nm (ASTM E1657-98)
<b>Linearity</b>	> 2.0 AU at 274 nm (ASTM E1657-98)

## Application Services

The success and productivity of our customers are important to us. Therefore, we not only pay attention to the highest quality in the development and production of our products, but also support you with your GPC/SEC application. In our applications lab we have experienced experts who can help you find the right GPC/SEC column. You can also contact us if you need method development.



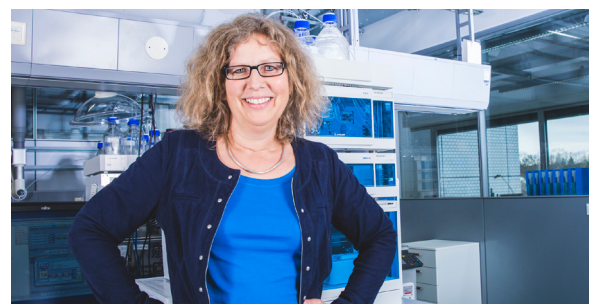


Worldwide partner in science since 1962

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. Both are still active as advisers to this day. 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 Sales Director Carsten Losch.

Today, KNAUER is an established company with 180 employees that successfully develops, manufactures and markets chromatography instruments worldwide.

## think LC. think KNAUER.

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KNAUER is the proud winner of the  
German Innovation Award 2022 in the  
category of medium-sized businesses.

**(U)HPLC • Prep. LC • FPLC • SMB • GPC/SEC • 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

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

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