

# AZURA<sup>®</sup> Analytical HPLC/UHPLC

► Stay flexible regarding flow rates and upgrade options



# AZURA® Analytical HPLC/UHPLC

## How much performance do you need?



▶ AZURA® Compact HPLC



▶ AZURA®

AZURA Analytical system features and options	Available pump heads Max. flow rate in ml/min		Gradient options			Max back pressure in bar		
	5	10	Isocratic	LPG	HPG	400	700	1000
AZURA Compact HPLC		✓	✓			✓		
AZURA HPLC Plus		✓	✓	✓	✓		✓	
AZURA UHPLC	✓			✓	✓			✓



If you want to use HPLC columns with a smaller particle size, a higher maximum system back pressure is needed.

Max. back pressure



HPLC Plus

▶ AZURA® UHPLC

Recommended column inner diameter	Recommended particle size	Sample Injection		Detector				Recommended K-Connect capillary inner diameter
		Manual injection	Auto-sampler	UVD	MWD	DAD	RID	
4–4.6 mm	5 µm	✓		✓			✓	0.45 mm
3–4 mm	3–5 µm	✓	✓	✓	✓	✓	✓	0.18 mm
3 or smaller	3 µm or smaller	✓	✓		✓	✓	✓	0.10 mm

# AZURA® Analytical HPLC/UHPLC

## Efficient and adaptable to your needs

The analytical HPLC and UHPLC systems of the KNAUER AZURA® liquid chromatography instruments are designed to support and facilitate your work. Whether doing routine analysis or demanding separation tasks, AZURA systems are the right tool to overcome your analytical challenges. Choose between different gradient forming technologies and maximum flow rates to find the best configuration for your task.

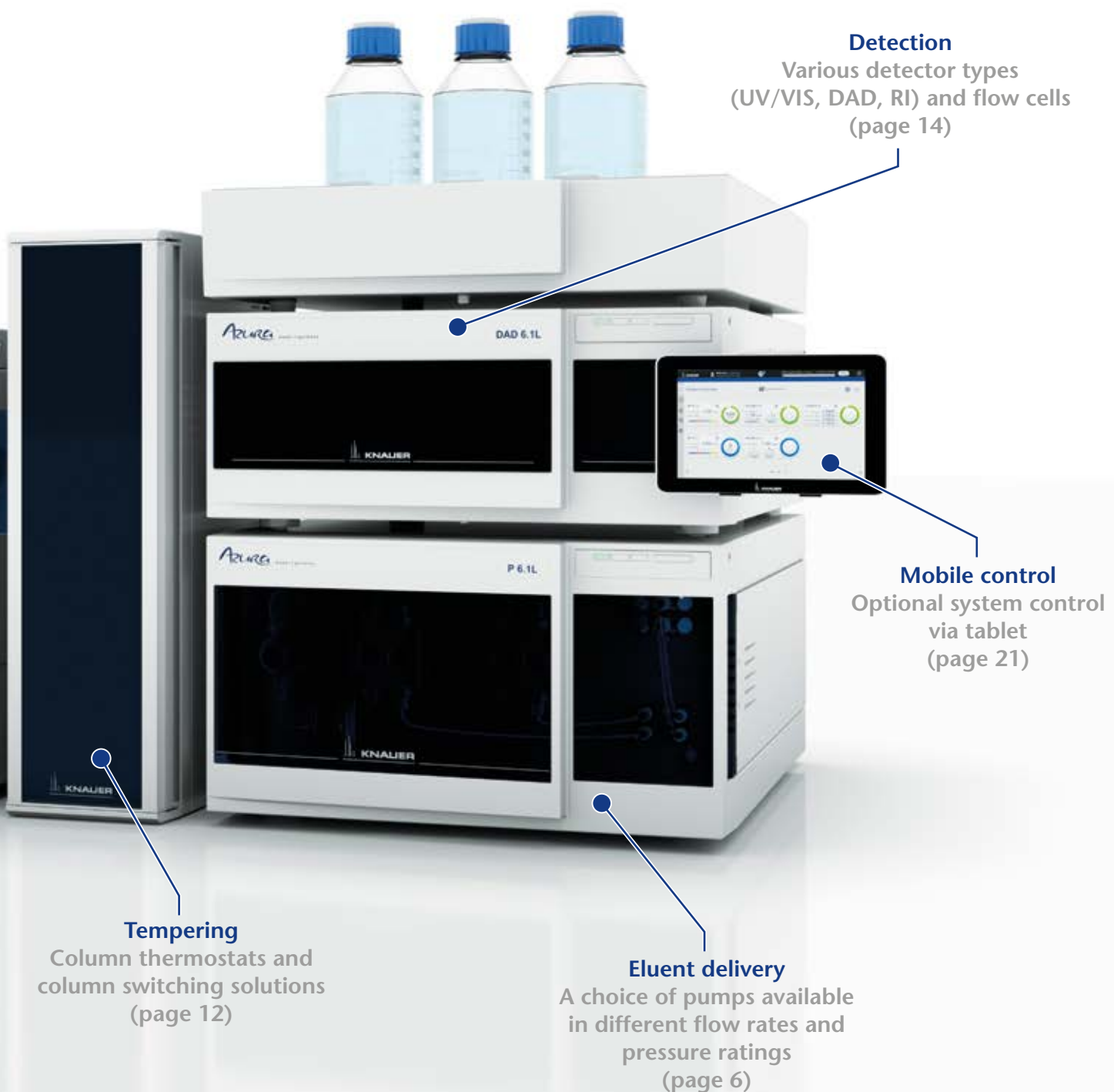
### ▶ AZURA Analytical HPLC/ UHPLC features

- Isocratic, binary high pressure gradient or quaternary low pressure gradient pump
- Pump heads allowing flow rates up to 10 ml/min at 700 bar or 1000 bar up to 2 ml/min
- Autosampler with 0.1 µl sample aspiration at max. 1200 bar with zero sample loss
- Choice of highly sensitive UVD, MWD, DAD, or RID detectors with intelligent temperature control
- Wide range of flow cells available, including remote cells
- Finger-tight high pressure stainless steel capillary connections “K-Connect”
- Extensive safety features such as leak management and sensors
- Frontal access of detector lamp and pump head for easy maintenance



### Injection

Automatic or manual injection  
(page 10)



**Detection**  
Various detector types  
(UV/VIS, DAD, RI) and flow cells  
(page 14)

**Mobile control**  
Optional system control  
via tablet  
(page 21)

**Tempering**  
Column thermostats and  
column switching solutions  
(page 12)

**Eluent delivery**  
A choice of pumps available  
in different flow rates and  
pressure ratings  
(page 6)

# Eluent delivery

## For highly accurate and precise HPLC and UHPLC

### ► AZURA Pump P 6.1L

The analytical pump AZURA P 6.1L combines all essential components of a first class HPLC pumping system. Three different configurations are available: A 2 x 2 binary high pressure gradient (HPG) for high accuracy blending of up to two eluents from two selectable solvents each; a low pressure gradient (LPG) for reliable blending of up to four eluents and a very cost-effective isocratic version for easy analyses.

Excellent separations with small particle size columns can be achieved with the high-performance pump heads featuring an extended back pressure. Choose between pump heads with a maximum flow rate of 10 ml/min and 700 bar<sup>1</sup> backpressure, or pump heads with a flow rate of 5 ml/min and 1000 bar<sup>2</sup> backpressure. Special pump heads for Normal Phase applications will help to deliver robustly even demanding eluents like heptane or hexane. Pumps without a degasser offer a cost effective alternative.



Choose your HPLC pump according to your application's needs. Gradient formation, mixer size and pulsation compensation will have an extensive influence.

**AZURA Pump Filter**  
Protects the column  
from contamination  
(2 µm filter disc)

**AZURA Mixer**  
Highly efficient microfluidic  
solvent mixer

### Available pump versions

Pump head (type): material, max. pressure	P 6.1L Isocratic	P 6.1L HPG	P 6.1L LPG
5 ml: stainless steel, 1000 bar <sup>2</sup>		✓	✓
10 ml: stainless steel, 700 bar <sup>1</sup>		✓	✓
10 ml normal phase: stainless steel, 700 bar <sup>1</sup>	✓	✓	
10 ml normal phase: stainless steel, 700 bar <sup>1</sup> without degasser	✓	✓	
10 ml: stainless steel, 700 bar <sup>1</sup> without degasser	✓	✓	✓

Optional: P 6.1L with 50 ml pump head available (max. 50 ml/min; 300 bar)

1) > 5 ml/min: max. 400 bar  
2) > 2 ml/min: max. 700 bar

▶ **AZURA® Pump P 6.1L**  
Binary HPG



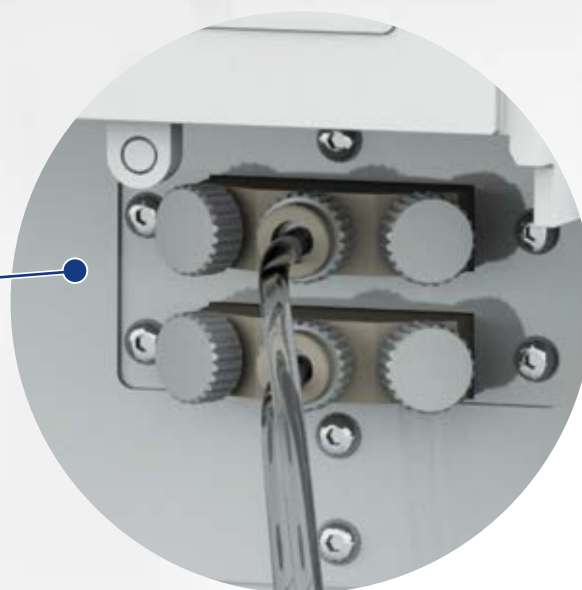
**Piston back flush**

This standard feature of the P 6.1L will wash away contaminations for prolonged seal lifetime

**Online Degasser**  
Reduces baseline noise resulting in higher sensitivity

**Solvent Selection Valve**

Integrated in every binary HPG pump, each channel can be used with two different solvents



# High or low pressure gradient?

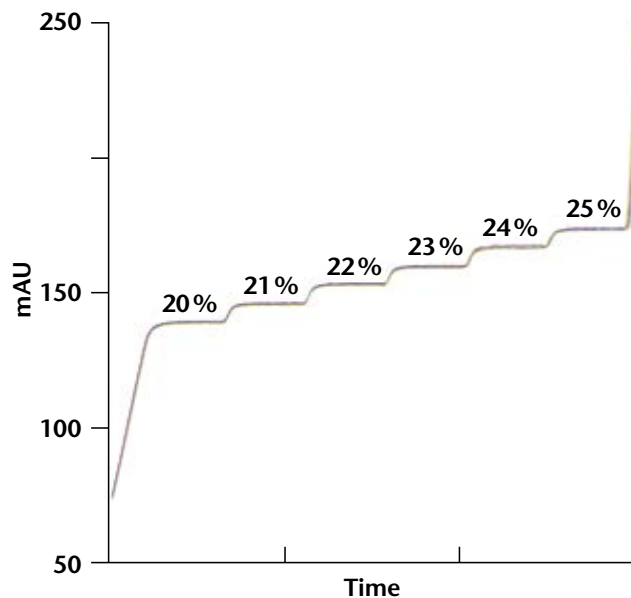
The choice of gradient formation technology is essential for a HPLC/UHPLC system. AZURA systems can be equipped with either a high or a low pressure gradient pump. Both techniques have advantages and disadvantages.

A **low pressure gradient** (LPG) module dynamically composes the eluent on the inlet-side or low pressure side of the pump head, by quickly switching between the different solvent channels. The AZURA pump technology adapts to the mixer volume and changes the valve switching cycle time accordingly.

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

Excellent gradient reproducibility of 0.3% RSD. Overlay of 6 repetitions at 1 ml/min run with pump P 6.1L low pressure gradient version

LPG	HPG
Low investment costs	Very fast gradients
Four channel blend	Smallest dead volume



## Choose a solvent mixer according to your application

### ▶ AZURA® Mixer Microfluidic solvent mixer

The sophisticated micro fluidics of the AZURA Mixer combine high mixing performance with a low dead volume. The user-changeable mixer is available in different volumes (50 / 100 / 200  $\mu$ l) allowing best possible adaption to any application or flow rate.



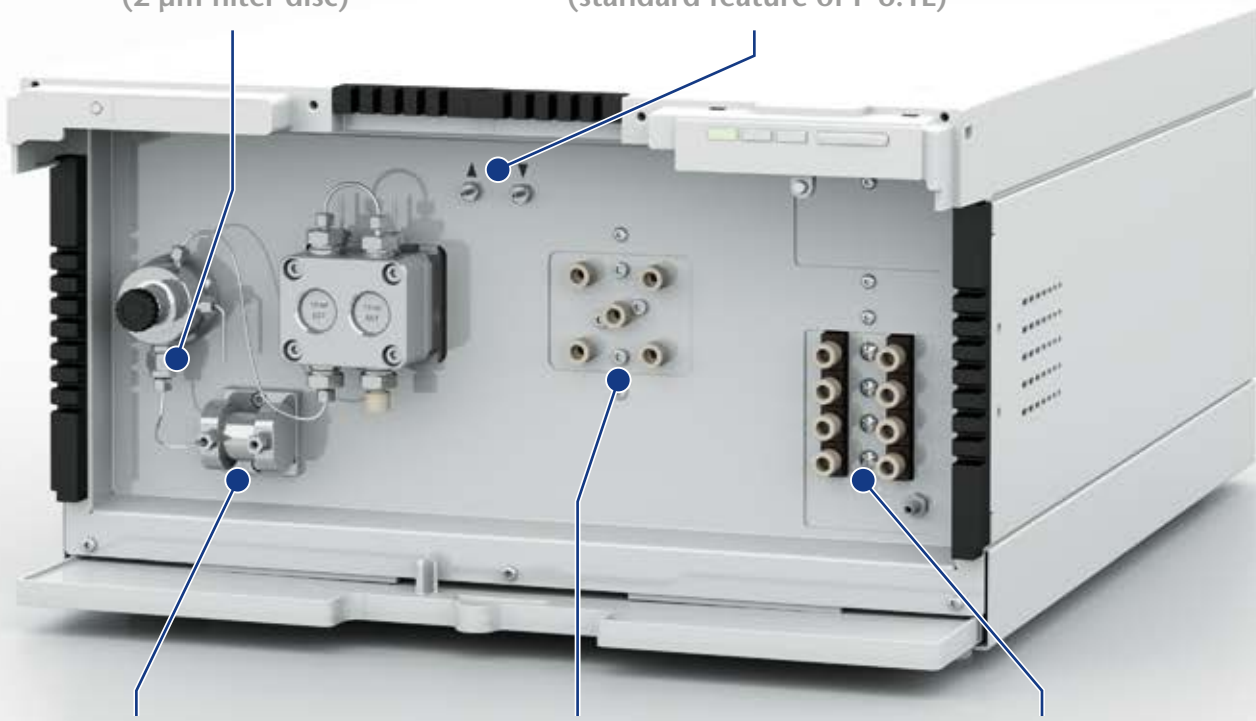
**AZURA® Pump P 6.1L**  
 Quaternary LPG

**AZURA Pump Filter**

Protects the column from contamination  
 (2 µm filter disc)

**Piston back flush**

Washes away contaminations for longer seal life  
 (standard feature of P 6.1L)



**AZURA Mixer**

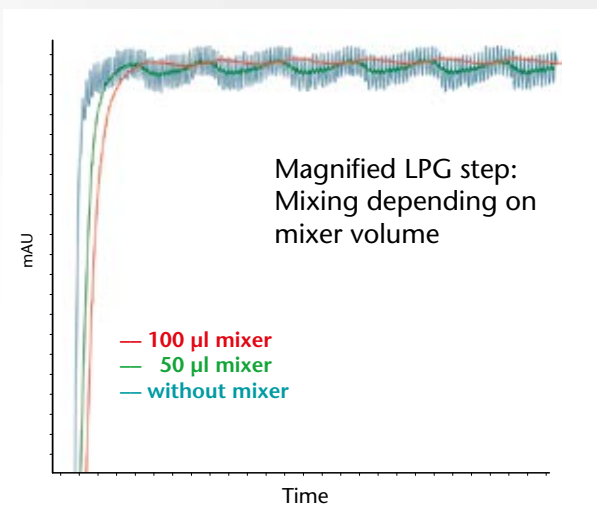
Highly efficient microfluidic solvent mixer

**Multi-proportioning valve**

Precise blending of up to 4 eluents

**4-Channel Online Degasser**

Reduces baseline noise enabling higher sensitivity



**!** A small mixer volume will improve system dead volume, but might decrease mixing efficiency.

# Sample injection

## ► Manual Injection Valve

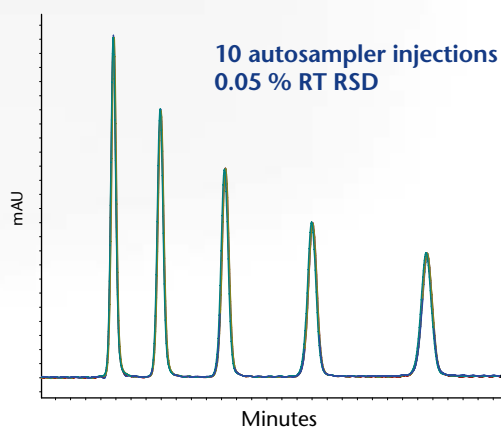
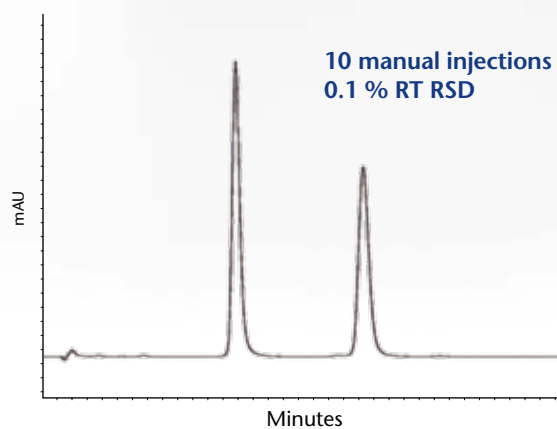
Manual injection valves are the most cost-effective alternative to introduce samples. KNAUER valves feature a backpressure range of up to 1000 bar with a 0.3 mm bore size.

All valves can be equipped with an automatic valve drive or can be integrated into an assistant module housing AZURA ASM 2.1L

Available valves	6-Port	8-Port
for actuator	2-position	2-position
for actuator	multiposition	multiposition
for manual injection	2-position	2-position



## Comparison manual vs. automatic injection



## ▶ Autosampler 3950 & Autosampler 3950 Basic

The Autosampler 3950 is a high precision Autosampler available for maximum backpressures of 1000 bar. This autosampler can inject from up to 768 positions when equipped with microtiter plates or from up to 108 standard 2 ml sample vials. This device is equipped with an ILD™ valve, consisting of a rotor-stator combination with a central port for depressurizing the sample loop before receiving the sample. This way, the sample is not diluted with solvent.

- Up to 1000 bar (Basic: 700 bar)
- Cooling/heating option (4 – 40 °C)
- 0.1 µl – 5000 µl sample injection volume
- Up to 768 samples (microtiter plates) or 108 standard vials
- Intermediate Loop Decompression – ILD™



Rack for 108 standard 2 ml vials



The integrated intermediate loop decompression valve reduces sample dilution and increases measurement reproducibility

# Column tempering

## ▶ Column Thermostat CT 2.1

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 prevent a column from overheating while keeping it at a very stable temperature.

- Temperature range 5 – 85 °C  
Heating/cooling rate 2 °C/min  
Temperature accuracy  $\pm 0.2$  °C  
Temperature stability  $\pm 0.1$  °C
- Optional pre-column eluent tempering
- Up to 6 columns with 350 mm max. length
- Max. 16 mm inner diameter
- Column switching option with ASM 2.1L
- Operation via software or in stand-alone mode



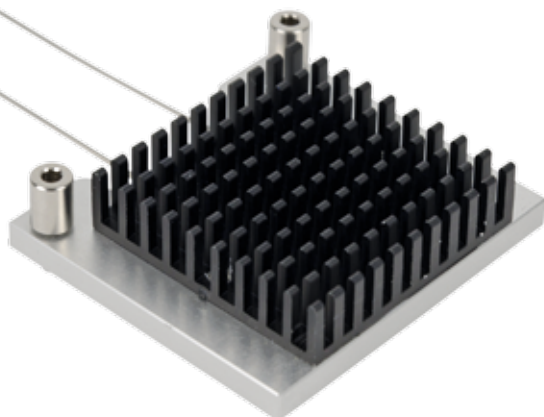
Using an HPLC column thermostat is highly recommended, since a stable temperature has an immense positive influence on retention time reproducibility



## Optional eluent pre-column tempering

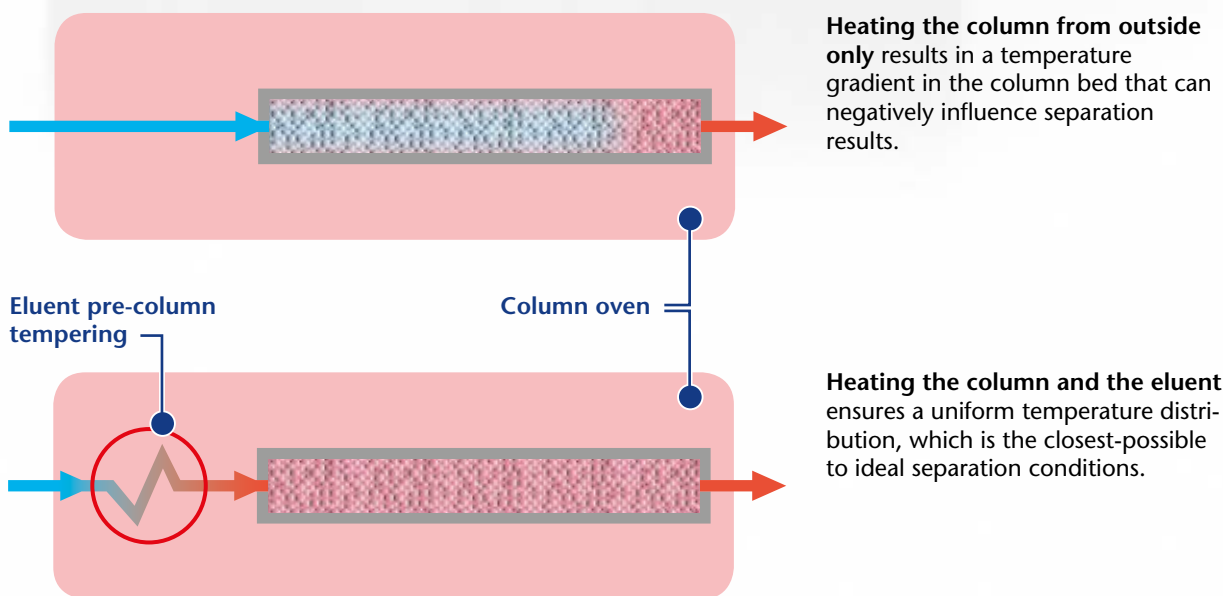
This device will converge solvent temperature with column temperature before entering the column and will therefore reduce temperature gradients within the column.

Available with 0.1 or 0.25 mm inner diameter (5  $\mu$ l/30  $\mu$ l inner volume). This device can be retrofitted to the oven chamber of the CT 2.1.



## ▶ Column Switching Assistant ASM 2.1L

Using two valves in one ASM 2.1L to establish column switching with up to 6 columns



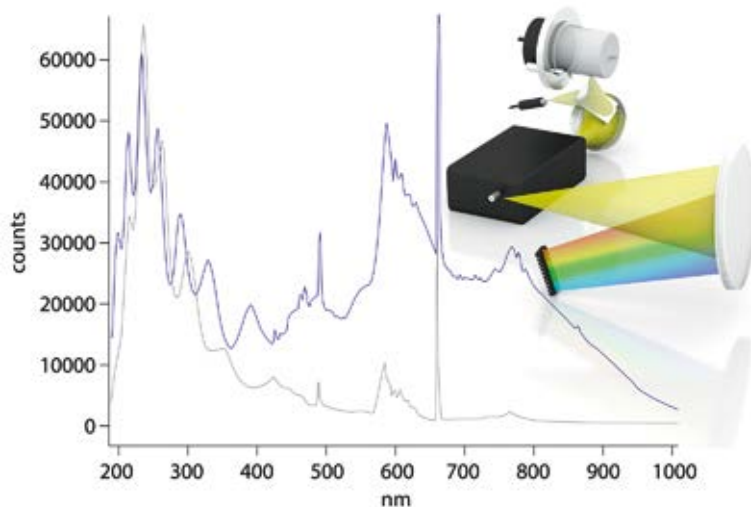
# Detection

## How sensitive do you need to measure?

We provide a choice of UV/VIS detectors, ranging from single variable wavelength to 8-channel diode array detector with LightGuide total reflection technology.

Wavelength range	190–700 nm				190–1000 nm
	190–500 nm	190–700 nm	190–700 nm	190–700 nm	190–1000 nm
<b>AZURA detector</b>	<b>UVD 2.1S</b>	<b>UVD 2.1L</b>	<b>MWD 2.1L</b>	<b>DAD 2.1L</b>	<b>DAD 6.1L</b>
	Compact and versatile UV detector	Reliable UV/VIS detector for a wide spectrum of applications	Robust multi-channel UV/VIS detector	Versatility through a wide flow cell range	High-end diode array detector with outstanding performance
<b>Channels</b>	1	1	8	8	8
<b>3D data acquisition</b>				✓	✓
<b>Data acquisition rate</b>	50 Hz	50 Hz	100 Hz	100 Hz	100 Hz
<b>Fiber optics available</b>	✓	✓	✓	✓	✓
<b>LightGuide Flow Cells</b>	✓	✓	✓	✓	✓
<b>PressureProof Flow Cells</b>	✓	✓	✓	✓	✓

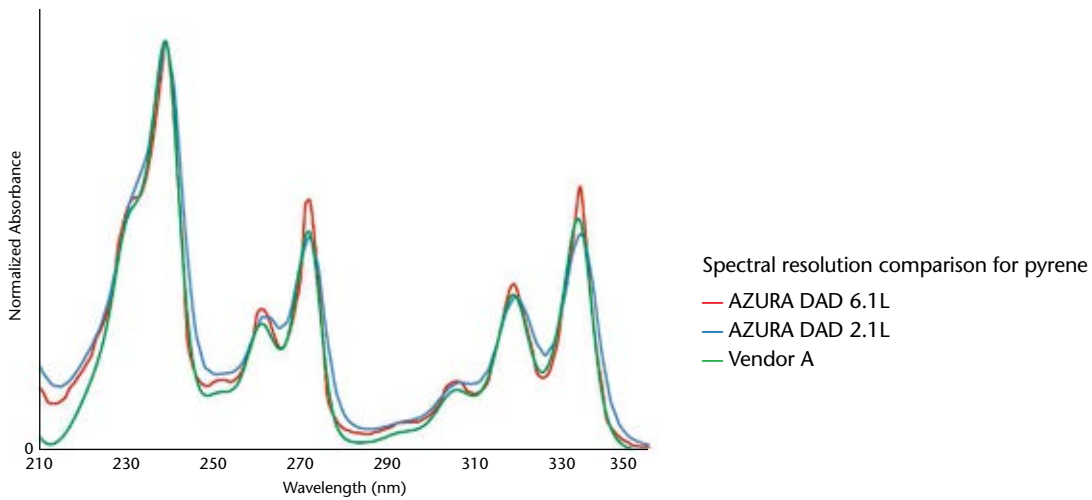
The AZURA DAD 6.1L is equipped with revolutionary KNAUER Polka-Dot technology providing maximum light intensity and low noise over the whole UV/VIS spectrum. This technology provides more light than previous shine-through lamp configurations.



**!** A halogen lamp is needed to detect analytes with a maximum absorption in the VIS range.

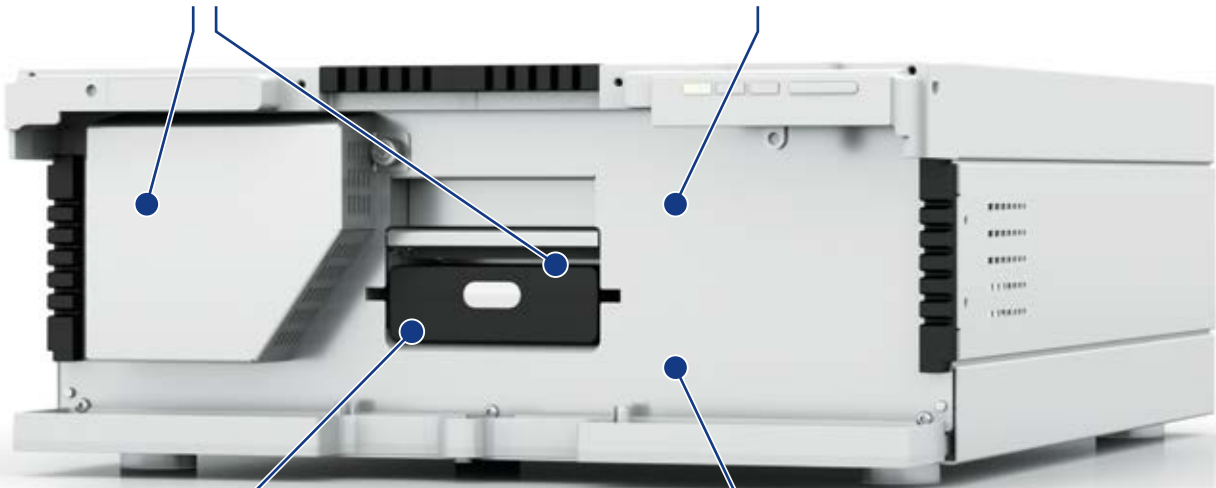
Intensity over wavelength comparison of Polka-Dot (blue) vs. Shine-through (grey) light mixing

Both AZURA diode array detectors DAD 6.1L and DAD 2.1L provide high spectral resolution enabling optimized identification and sample characterization.



**Accessible**  
frontal lamp and  
flow cell exchange

**Sensitive**  
LightGuide flow cells and  
Polka-Dot technology



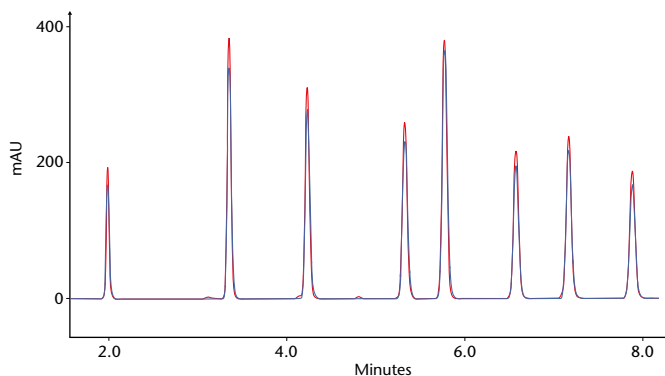
**Flexible**  
wide flow cell range  
for high application  
versatility

**Robust**  
intelligent temperature control  
for minimal drift

# Detection

## Which flow cell suits your application best?

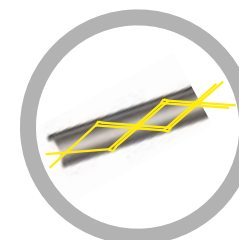
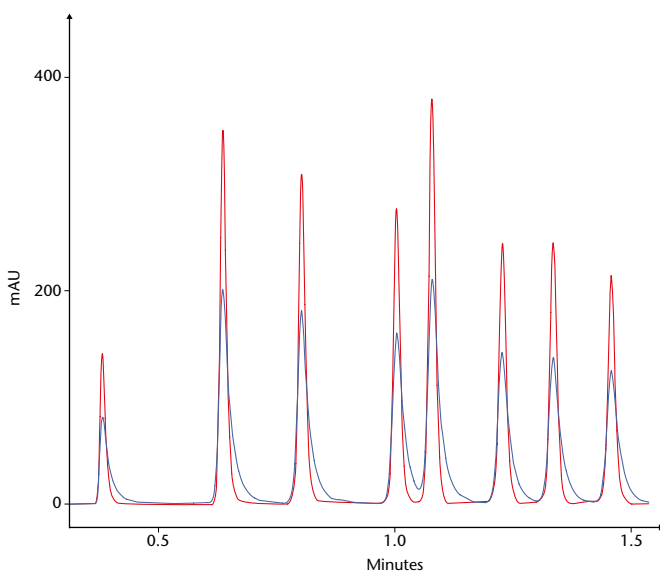
The KNAUER PressureProof flow cells are available for all AZURA UV/VIS detectors in cartridge and classic design. These highly robust and price attractive flow cells feature an increased back pressure stability (up to 300 bar) and extended flow rates range (up to 20 ml/min).



PressureProof principle

HPLC separation performed with an analytical PressureProof flow cell (blue) vs. a Standard LightGuide flow cell (red)

The Standard LightGuide Flow Cell Cartridge combines total reflection technology with small cell volume for high throughput and high resolution applications.

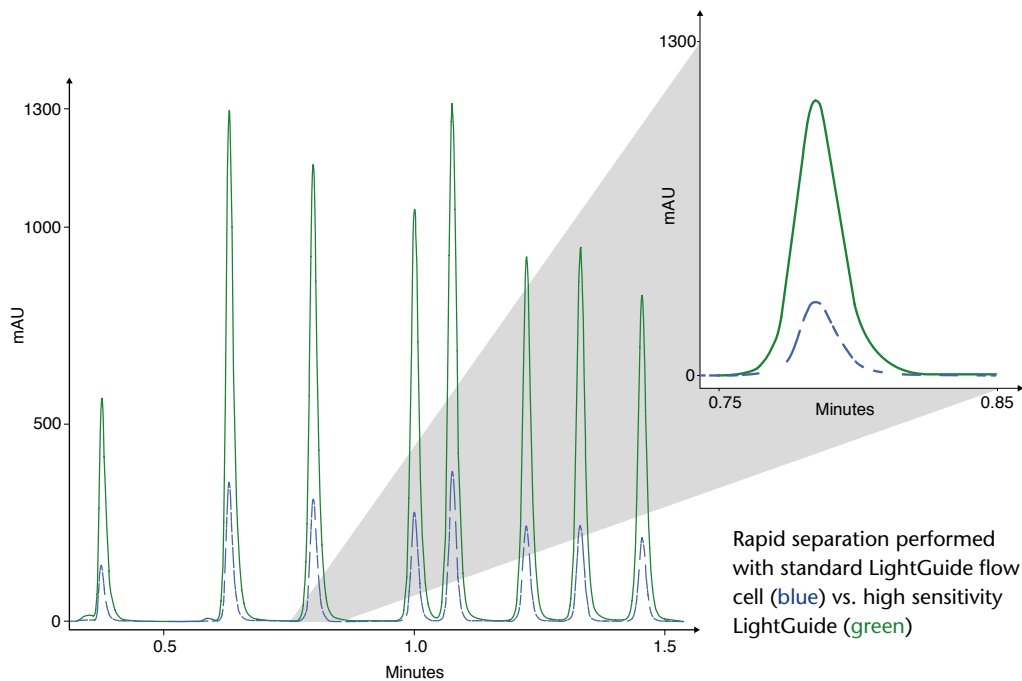


LightGuide principle

UHPLC separation performed with an analytical PressureProof flow cell (blue) vs. standard LightGuide flow cell (red)

The High Sensitivity LightGuide Flow Cell Cartridge is available for the entire AZURA DAD series. With the lowest dispersion volume on the market and long path length this total reflection flow cell is the ultimate choice for demanding trace analysis.

Ultimately sensitive UHPLC



## Remote HPLC detection

KNAUER fiber optic technology offers the possibility to separate the flow cell spatially from the detector via fiber optic cables in a distance up to 10 meters. This enables the measurement of UV/VIS absorption in flow-through mode remotely from the detector.



Fiber optics enable the flow cell to be located very close to the column, minimizing peak broadening.

DAD with remote nano flow cell



[www.knauer.net/detectors](http://www.knauer.net/detectors)

# Detection

No chromophor? No problem.



## Great performance

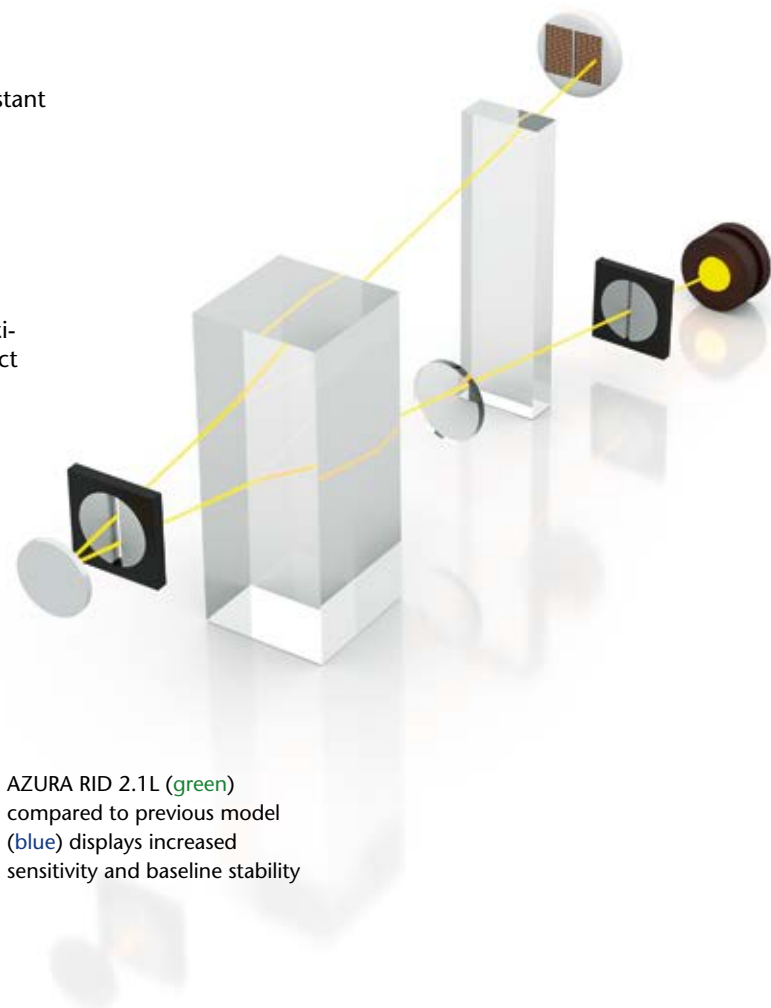
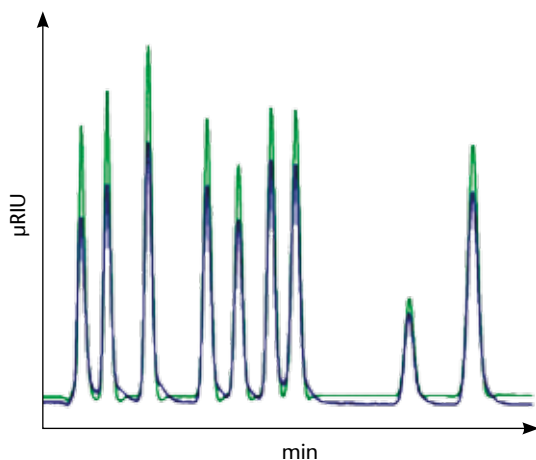
The AZURA RID 2.1L is a highly competitive and sensitive refractive index detector, ideal for fast and reliable routine analysis of non-UV absorbing substances. The intelligent temperature control guarantees fast baseline stabilization and stable operation.

## Great stability

Furthermore, the long-life LED, highly pressure resistant flow cell, improved safety features and enhanced diagnostics functions guarantee easy handling and minimal maintenance.

## Great versatility

The wide linear dynamic range and 10 ml/min maximum flow rate make the AZURA RID 2.1L the perfect choice for most laboratory tasks.



AZURA RID 2.1L (green) compared to previous model (blue) displays increased sensitivity and baseline stability

A wide range of third-party detectors can be seamlessly integrated into AZURA analytical systems.

Gradient compatible universal detection



Using the unique Low Temperature technology, this Evaporative Light Scattering detector 85 LT allows universal high sensitivity analysis.

Sensitive and selective detection



The electrochemical detector DECADE Elite has been developed to meet the demands in ultra fast analysis, as to detection sensitivity, acquisition frequency and temperature specifications.

Sensitive and selective fluorophor detection

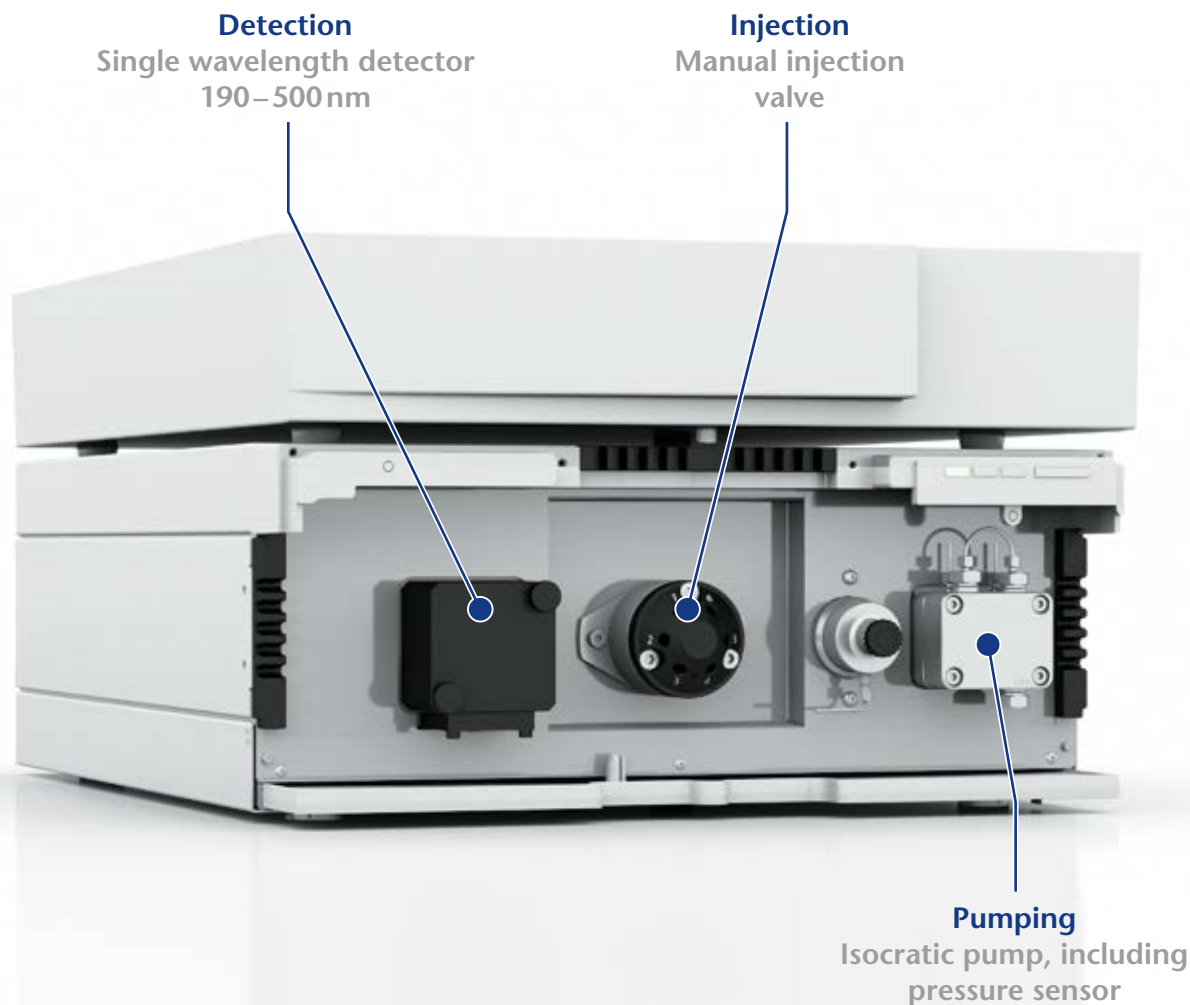


The fluorescence detector RF-20A provides world-class sensitivity, excellent maintainability and diverse validation / support functions. It supports a wide range of applications from conventional to high-performance analysis.



The KNAUER interface box IFU 2.1 allows highly precise analog acquisition of data and control of third party modules over analog and relay outputs.

# AZURA<sup>®</sup> Compact HPLC system



## ▶ AZURA<sup>®</sup> Compact HPLC system isocratic

Complete small isocratic HPLC system

- Degassing unit
- Pump P 4.1S
- Detector UVD 2.1S
- Manual injector
- Eluent Tray

The clearly defined system layout helps to readily understand the different functions of the HPLC system. All important components are easy to access and maintain. The system is controlled by a laptop that also analyzes the measured data.

Recommended software solutions:

- Mobile Control
- ClarityChrom<sup>®</sup>

# Mobile Control

AZURA® devices at your fingertips



## ▶ AZURA® Mobile Control

With the Mobile Control app you have your AZURA devices at your fingertips: Easily check the status or set parameters of several devices or several systems simultaneously, even outside the laboratory. With the possibility of data acquisition, the Mobile Control is the perfect addition to the AZURA Compact Prep LC system. This combination represents a truly space-saving HPLC solution. No additional computer or software is needed. Control every AZURA system in your laboratory with one tablet.

Mobile Control is safe: it ensures that device parameters can only be changed by authorized operators. The Mobile Control app can be run from a tablet or PC with Windows 8 or higher. Depending on the hardware control is possible via WLAN or Ethernet.

- Control your devices or systems from your desktop
- Easily switch between your AZURA systems and monitor all of them
- Create different user accounts to securely manage your systems
- Work effortless with the intuitive user-interface
- Optionally record data and control fraction collection

**!** See all parameters of your system on one screen wherever you go.

Two licences:

- Mobile Control
- Mobile Control Chrom (with data acquisition)

## HPLC of sugars, organic acids and alcohols: Polymer based phases

Ideal for the organic solvent free analysis of:

- Fruit beverages
- Soft drinks
- Wine
- Beer
- Fermentation broths

H-form (USP L17)

Analysis organic acids, sugars and alcohols

Ca-form (USP L19)

Pb-form (USP L34)

Na-form (USP -)

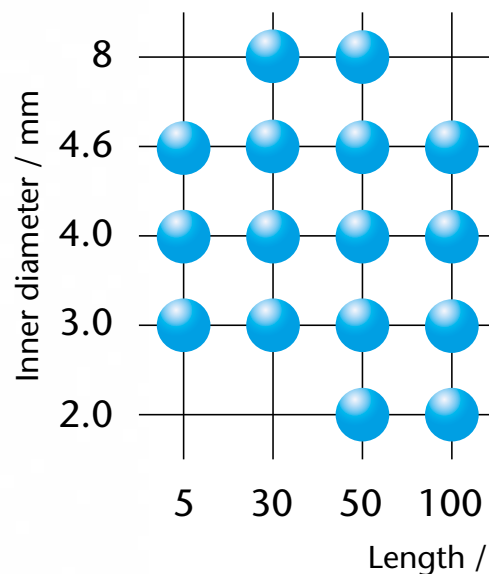
Analysis of small carbohydrates (< DP4)

Ag-form (USP -)

Analysis of sugar oligomers (up to DP8)



## KNAUER LC Analytical column



## HPLC of proteins and peptides: Silica based phases

Your first choice for the analysis of:

- Proteins
- Peptides
- Oligonucleotides

Wide pore C18 (USP L1)

Wide pore C18A (USP L1)

Wide pore C8 (USP L7)

Wide pore C4 (USP L26)

MW > 2000 Da

MW > 5000 Da

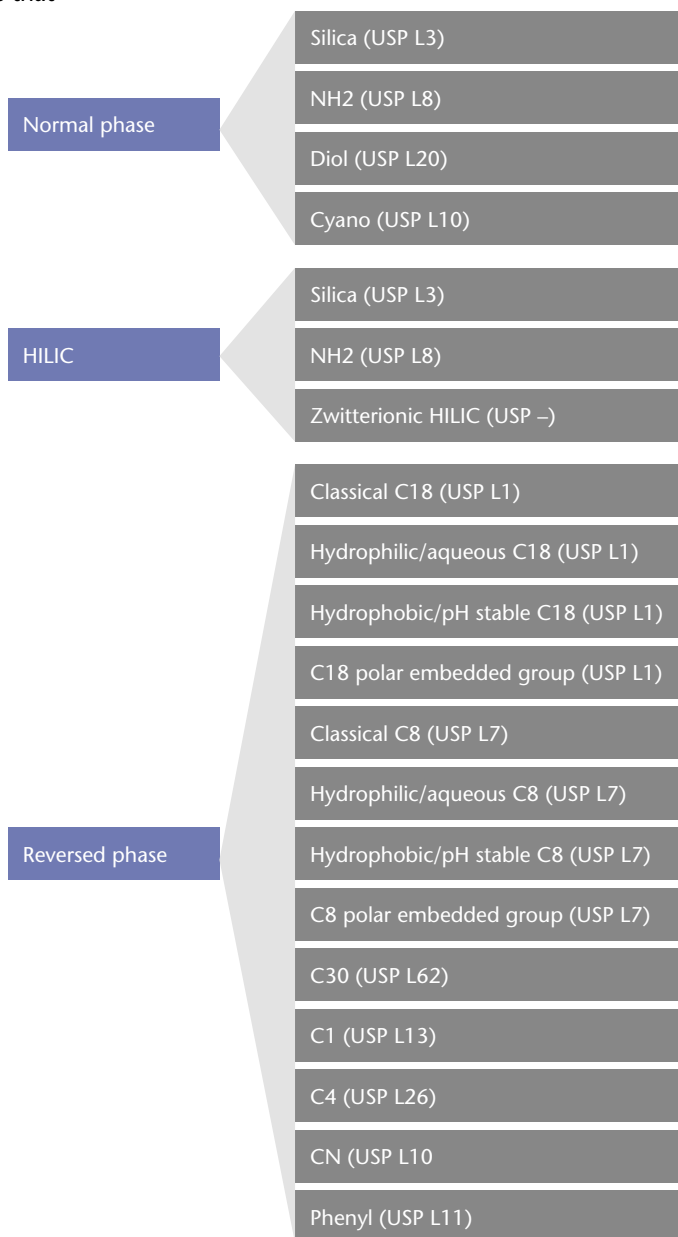
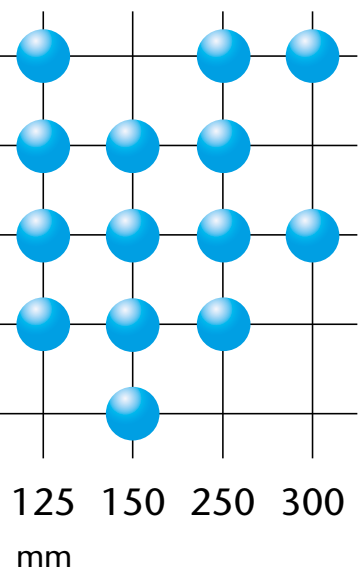
MW > 20000 Da

# HPLC/UHPLC of small molecules: Silica based phases

The best choice for a wide range of application areas for small molecules (< 2000 Da)

- Reversed phase mode for water- and water/organic solvent mix- soluble samples
- Normal phase mode for water insoluble samples
- HILIC mode for highly polar samples that are not retained by RP chromatography
- Ion pair chromatography for acids and bases that are poorly retained in RP mode

## columns dimensions:



We offer replacements for nearly any HPLC column on the market.

# Solutions for your food analysis

## ▶ Eurokat

High performance polymer phases

### Modifications

- **Eurokat H:** separation of organic acids, sugars, alcohols and sugar alcohols
- **Eurokat Pb/Ca:** Separation of carbohydrates up to DP < 4
- **Eurokat Na/Ag:** Separation of sugar oligomers and carbohydrates up to DP 8

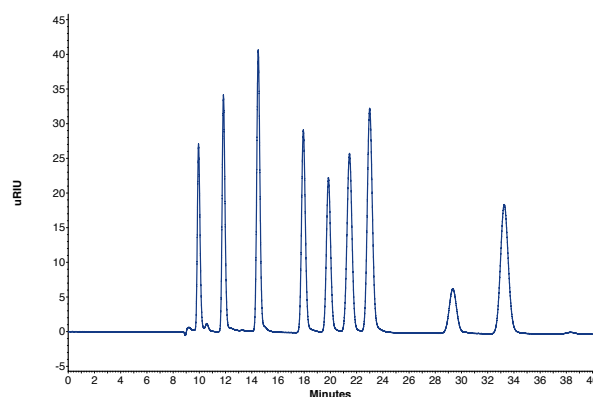
DP = degree of polymerization



Recommended Eurokat column dimension for best results: 300 x 8 mm ID analytical column, 30 x 8 mm ID precolumn.

## Key application

Separation of alcohols, carbohydrates and organic acids



Device	Key features
AZURA ASM 2.1L	Isocratic analytical HPLC pump, 10 ml pump head including injection valve
AZURA UVD 2.1S	190–500 nm, variable single wavelength UV detector
AZURA RID 2.1L	Temperature controlled, extended dynamic range
AZURA CT 2.1	Column thermostat for constant temperatures and reproducible results

## ▶ Sugar HPLC system

Analytical isocratic configuration with UV and RI detection



# Solutions for your environmental or pharmaceutical analysis

## ▶ Eurosphere & Eurosphere II

High performance column material based on an ultra pure spherical silica gel

### Highest flexibility

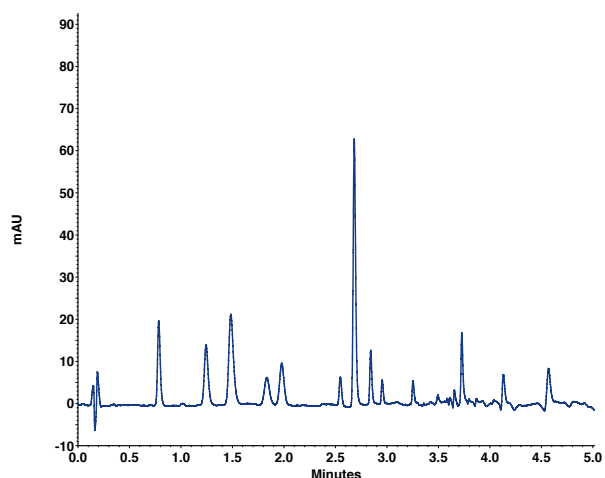
- Classical HPLC, Fast HPLC Plus, UHPLC
- 13 modification types
- 100 Å pore size
- 2–10 µm, up to 20–45 µm



Find more key applications at [www.knauer.net/applications](http://www.knauer.net/applications)

## Key application

Determination of priority pollutant phenols



Device	Key features
AZURA P 6.1L	Quaternary analytical HPLC pump with degasser, 10 ml pump head
AZURA DAD 2.1L	190–700 nm, diode array detector
AZURA CT 2.1	Column thermostat for constant temperatures and reproducible results
Autosampler 3950	Fast and very versatile analytical HPLC autosampler, 1000 bar, 0.1–5000 µl injection volume

## ▶ HPLC Plus system

Analytical LPG configuration with DAD detection



[www.knauer.net/applications](http://www.knauer.net/applications)

# Software

## Connect the KNAUER LC system to your chromatography data system (CDS)

### ► ClarityChrom®

KNAUER ClarityChrom® is a powerful, yet easy-to-use chromatography software for instrument control, data acquisition and data processing. ClarityChrom is designed for smaller laboratories. It is an economical solution compared to other more complex chromatography software while still offering FDA 21 CFR Part 11 compliance.

It is as an analytical chromatography software solution:

- Complete LC and autosampler control package
- Support for a wide range of instruments
- Scalable from 1 to 4 LC systems (instruments), each with up to 12 detectors (channels)
- Optional extensions, e.g. for PDA data handling, GPC analysis, SST for automated system tests and GC control

ClarityChrom supports all KNAUER devices that can be controlled by software. Please refer to the supported instruments list at [www.knauer.net/cds-devices](http://www.knauer.net/cds-devices). Moreover, devices and systems from more than 45 manufacturers can be controlled. Additionally, data acquisition can also be performed with any detector providing a voltage output by simply connecting a KNAUER IFU 2.1 interface box or any other supported A/D converter.

### ► Chromeleon™

Chromeleon is one of the most wide-spread chromatography data systems. Its intuitive handling benefits laboratory workflow and the highly developed algorithms simplify data processing. It offers a broad range of third-party drivers and can be easily used with existing HPLC systems. KNAUER offers drivers for a lot of its devices.

### ► OpenLAB® CDS EZChrom Edition

OpenLAB CDS EZChrom Edition is latest technology and successor of former ChromGate CDS. It provides chromatography data acquisition, processing and control of LC systems. It is scalable from single user/single instrument to multi-user/multi-instrument laboratories. Devices from KNAUER and many other manufacturers are supported.



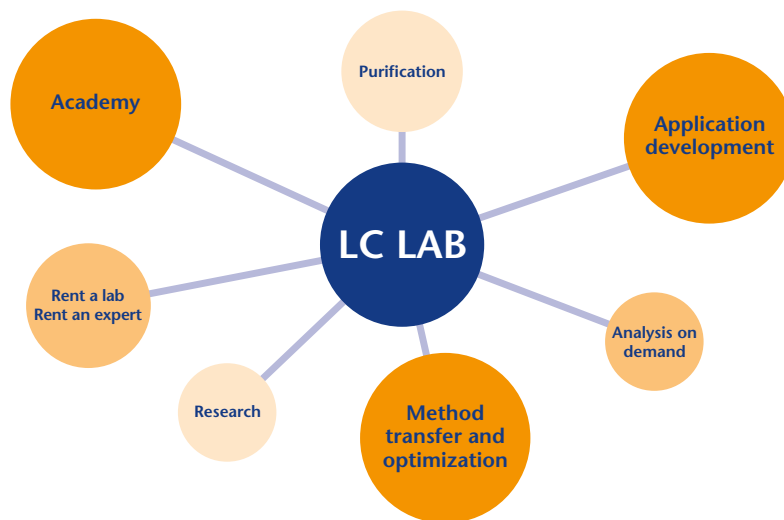
Every software solution offers different functionality. Choose the right one that fits your needs.





# Your liquid chromatography specialists

With profound application knowledge of analytical and preparative HPLC and FPLC, our team is at your service around the world. Our experts are pleased to receive your inquiries and requests, and will offer attractive customized solutions.



## Method transfer & optimization

Transfer your methods to one of our HPLC systems or make your analyses faster, more efficient and cost effective

## Rent a lab/ Rent an expert

Rent lab space with a suitable HPLC or an expert for assistance in your lab



## Academy

HPLC trainings and specialized courses for beginners and experienced users

## Analysis on demand

Fast and reliable custom-tailored analytical HPLC service



## Application development

Proof of concept and support in selecting a HPLC/FPLC method for your separation task

## Purification

Complete solutions for your HPLC, FPLC, SMB or continuous processes



## AZURA UHPLC systems

AZURA UHPLC:  
advanced systems for  
highest demands and  
most complex tasks up  
to 1000 bar.



[www.knauer.net/uhplc](http://www.knauer.net/uhplc)

## AZURA HPLC Plus systems

AZURA HPLC Plus:  
the complete solution for  
your daily HPLC routine  
with a "Plus"-feature of  
700 bar max. pressure.



[www.knauer.net/hplcplus](http://www.knauer.net/hplcplus)

## AZURA Compact HPLC systems

AZURA Compact HPLC:  
the basic HPLC system with  
ultimate flexibility on  
minimal space!



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## AZURA Educational system

The AZURA Educational  
system is a complete HPLC  
system, specially designed  
for the education of future  
HPLC professionals.



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## AZURA Mobile Control

With the AZURA Mobile  
Control app by KNAUER,  
you can control selected  
AZURA devices from your  
tablet.



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## HPLC · SMB · Osmometry

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