

Exploring solutions

► How do you get along with HPLC?



**CHROMATOGRAPHIC
SPECIALTIES INC.**

www.chromspec.com

1-800-267-8103 • instrum@chromspec.com



Our passion: liquid chromatography.

Our driving force: pure curiosity.

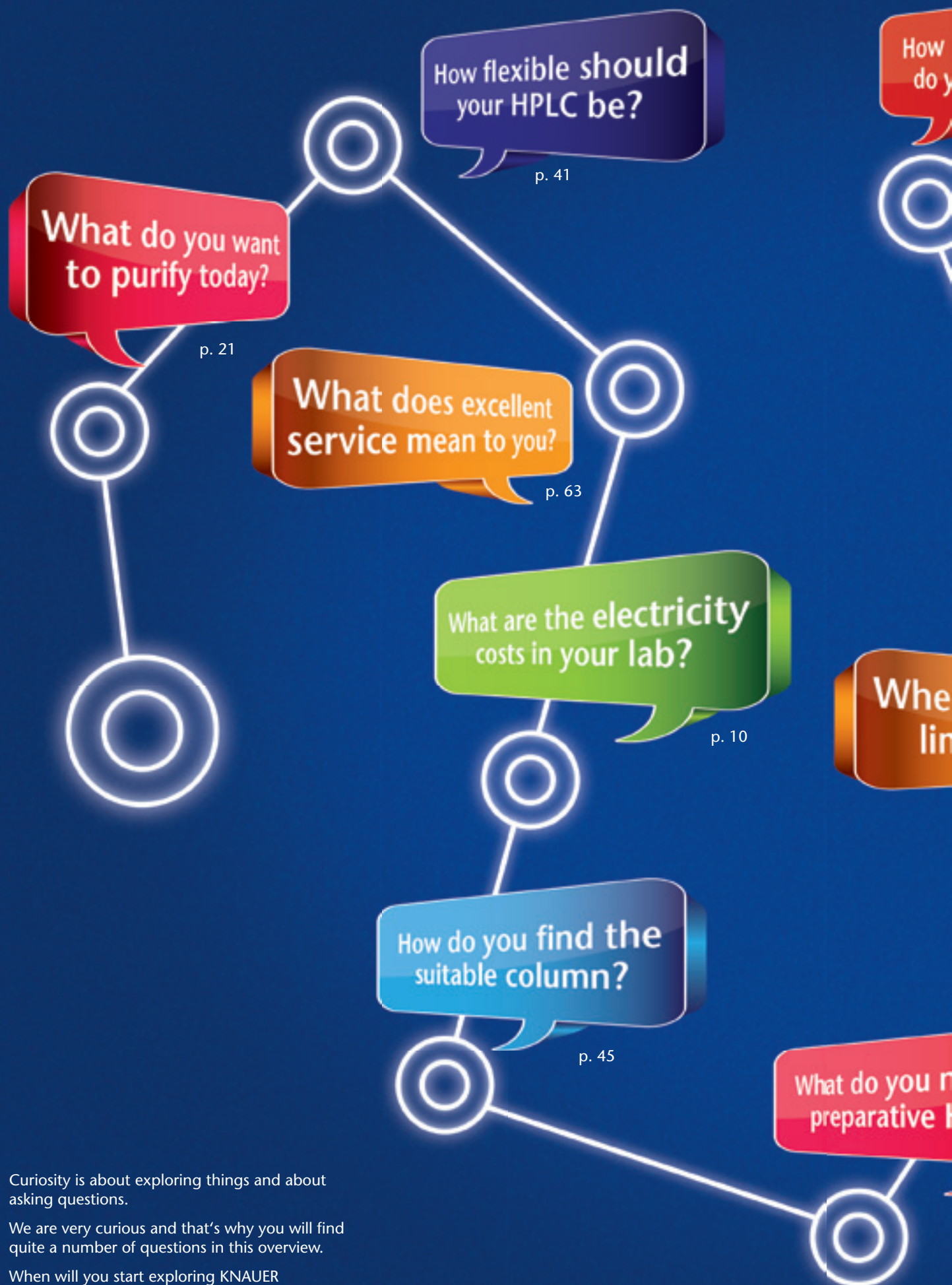
Sophisticated and eco-friendly solutions
supporting customers worldwide.

Craftsmanship and innovation.

Experience and enthusiasm.

KNAUER, a modern German family business –
50 years of knowing how.





Curiosity is about exploring things and about asking questions.

We are very curious and that's why you will find quite a number of questions in this overview.

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you have?

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LCA

Life cycle assessment

What do modern refrigerators
and KNAUER HPLC systems
have in common?



LCA

Life cycle assessment

It is interesting to note that consumer products like refrigerators nowadays have very low energy consumption expressed in A+++ ratings* as a key benefit for the customer. This is not yet true for capital goods. We at KNAUER believe that our customers have the right to get access to A+++ HPLC systems. Thus in 2010 KNAUER became a pioneer in the field of life cycle assessment for HPLC systems. In a tedious process together with Scientists from the Technical University of Berlin we determined the environmental footprint of our HPLC systems. We strive for further reduction of the environmental footprint when we develop new instruments. We also invite all manufacturers to do the same. As a result the customer can choose the HPLC systems with the best energy consumption rating.

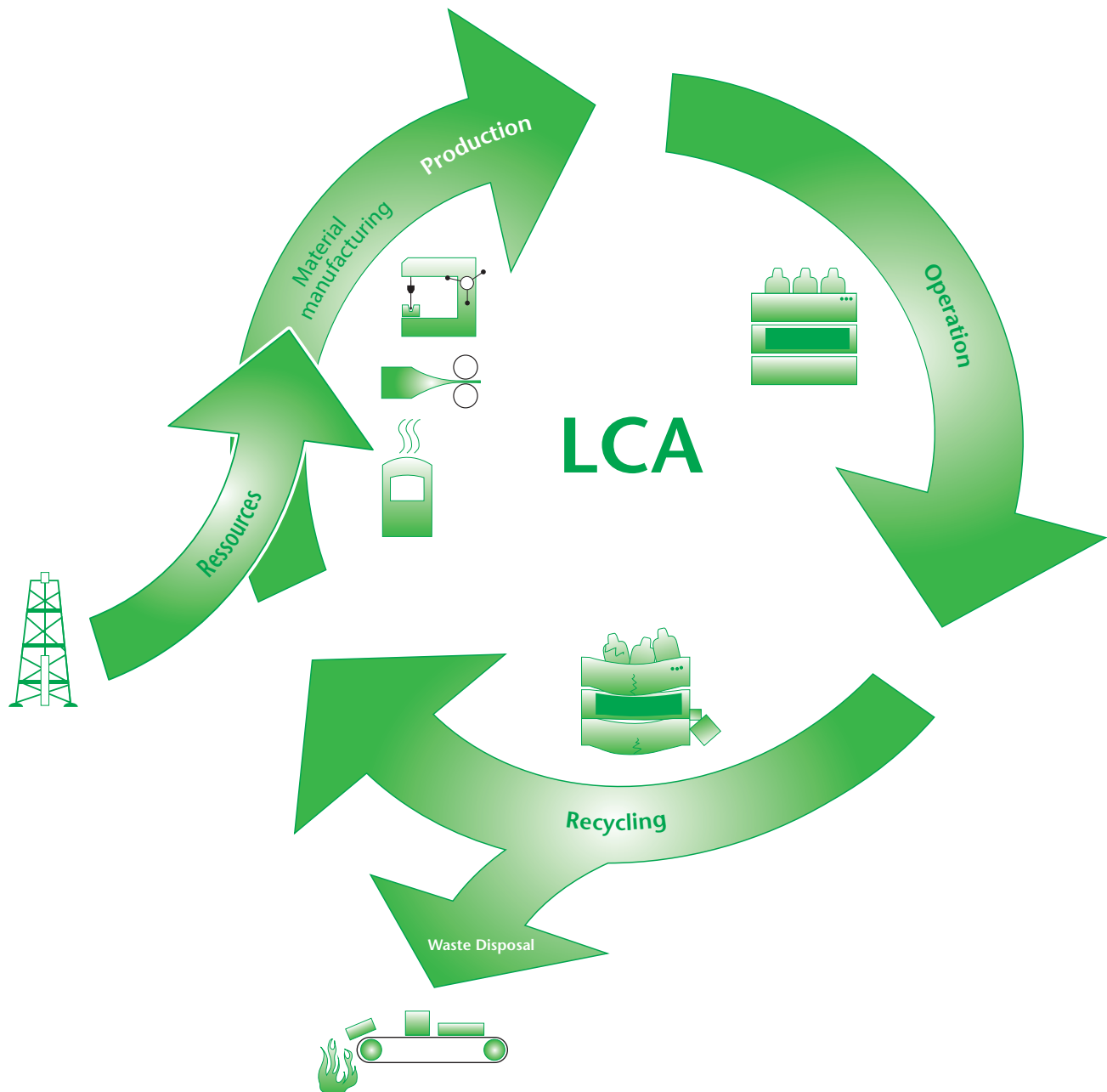
*) The EU energy label rates the energy efficiency of consumer appliances in classes from A (high) to G (low efficiency) and had to be extended to A+, A++, and A+++ to keep up with advances in energy efficiency.

What is a life cycle assessment?

- ▶ Life cycle assessment is a method that evaluates all potentially environmentally relevant impacts from products or processes
- ▶ All phases of the product life cycle, from resource extraction through manufacturing, utilization, up to and including disposal, are taken into account
- ▶ The environmental impacts are then considered within an impact assessment. Here, the connection between material flows and the resulting environmental impacts is described with the help of existing models
- ▶ Based on different impact categories, e.g. global warming, the potential environmental impacts can be calculated



The life cycle of a KNAUER device

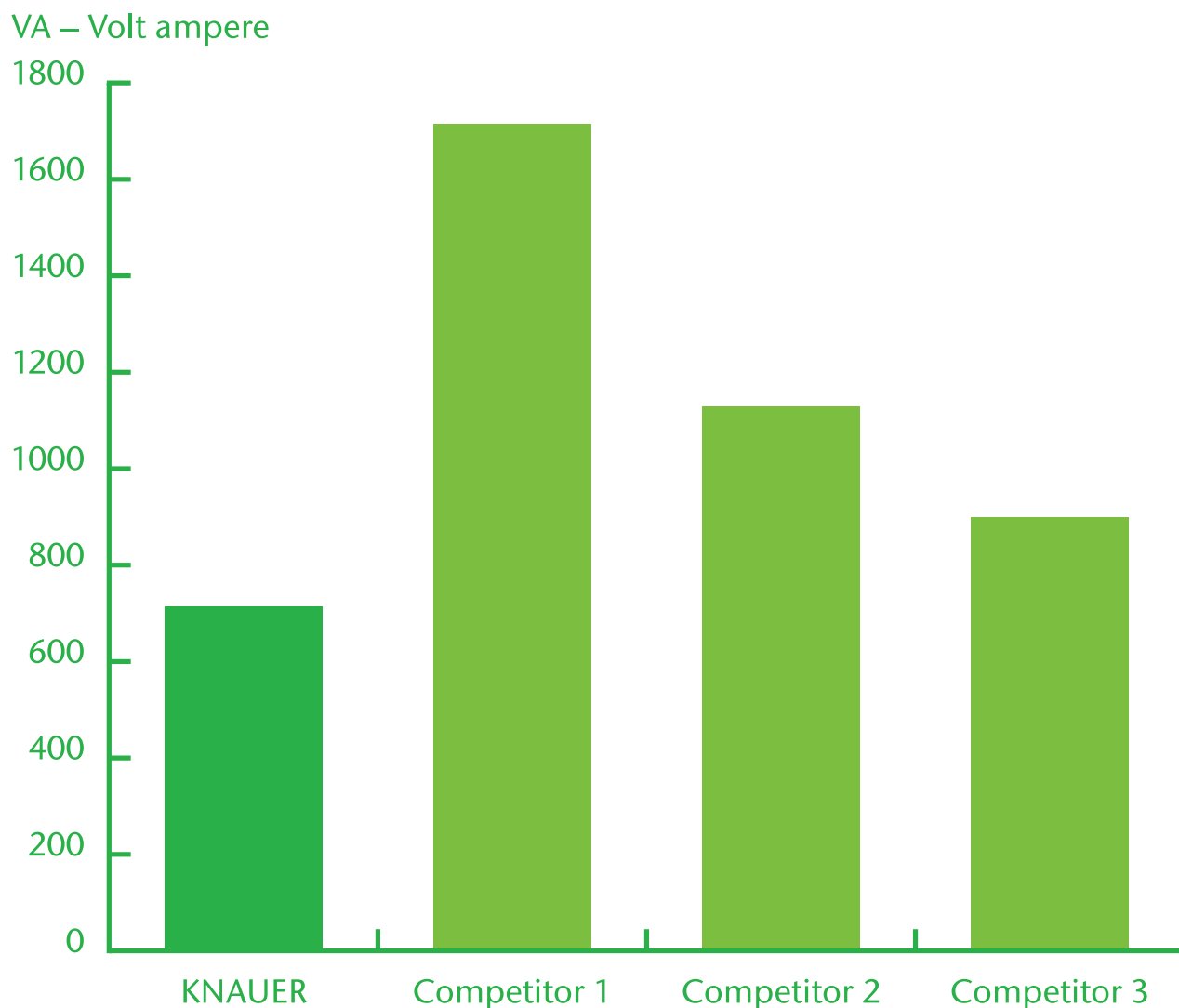


For more information



www.knauer.net/lca

What are the electricity costs in your lab?



Once you think in categories of environmental impacts of your lab equipment you will address this question. We have carefully examined the electricity bill in our labs and were surprised how much electricity was used before we started working on ways to reduce it.

Start with KNAUER HPLC systems and you will save electricity twofold because apart from the lower energy consumption of the instruments you also save energy for air conditioning because there is less heat produced by our instruments.

What do you have in mind when you think of the KNAUER LCA initiative?

We at KNAUER constantly have new ideas. LCA is just one. We look at the whole product life cycle in order to further minimize the environmental impact of our future HPLC systems.

- ▶ Did you know that there are new materials behaving like synthetic polymers which are based on natural materials like lignin being a waste material in the paper industry?
- ▶ Did you know that KNAUER will take back your old HPLC systems, disassemble them and recycle almost 100% of the materials?
- ▶ Did you know that with our ultra-fast PLATINblue system you can save a significant amount of solvent due to the smaller columns used and the shorter analysis time?
- ▶ Also, as a forerunner in this field we intend to inspire others in the market to follow our example so that you can then pick the ecologically friendliest HPLC system there is.

When do you start to make a change?



PLATINblue

Ultra fast, mega flexible

How much time
do you have?



PLATINblue

Ultra fast, mega flexible

Time is precious. Increase your laboratory's productivity with PLATINblue UHPLC/HPLC Plus systems. Achieve high resolution, short cycle times, high throughput, and fast detection. With the KNAUER application support you may also want to save time when optimizing your method.

PLATINblue features

- ▶ Modular system architecture
- ▶ Eluent supply with integrated degasser
- ▶ Optimized system volume for high resolution
- ▶ High speed autosampler
- ▶ Fast detectors, up to 100 Hz data rate
- ▶ PDA available with high sensitivity flow cell
- ▶ User-friendly design and operation
- ▶ Supported by software packages: ChromGate®, OpenLAB, and Chromeleon®, as well as MS software Xcalibur™ and Analyst™

Gradient flexibility

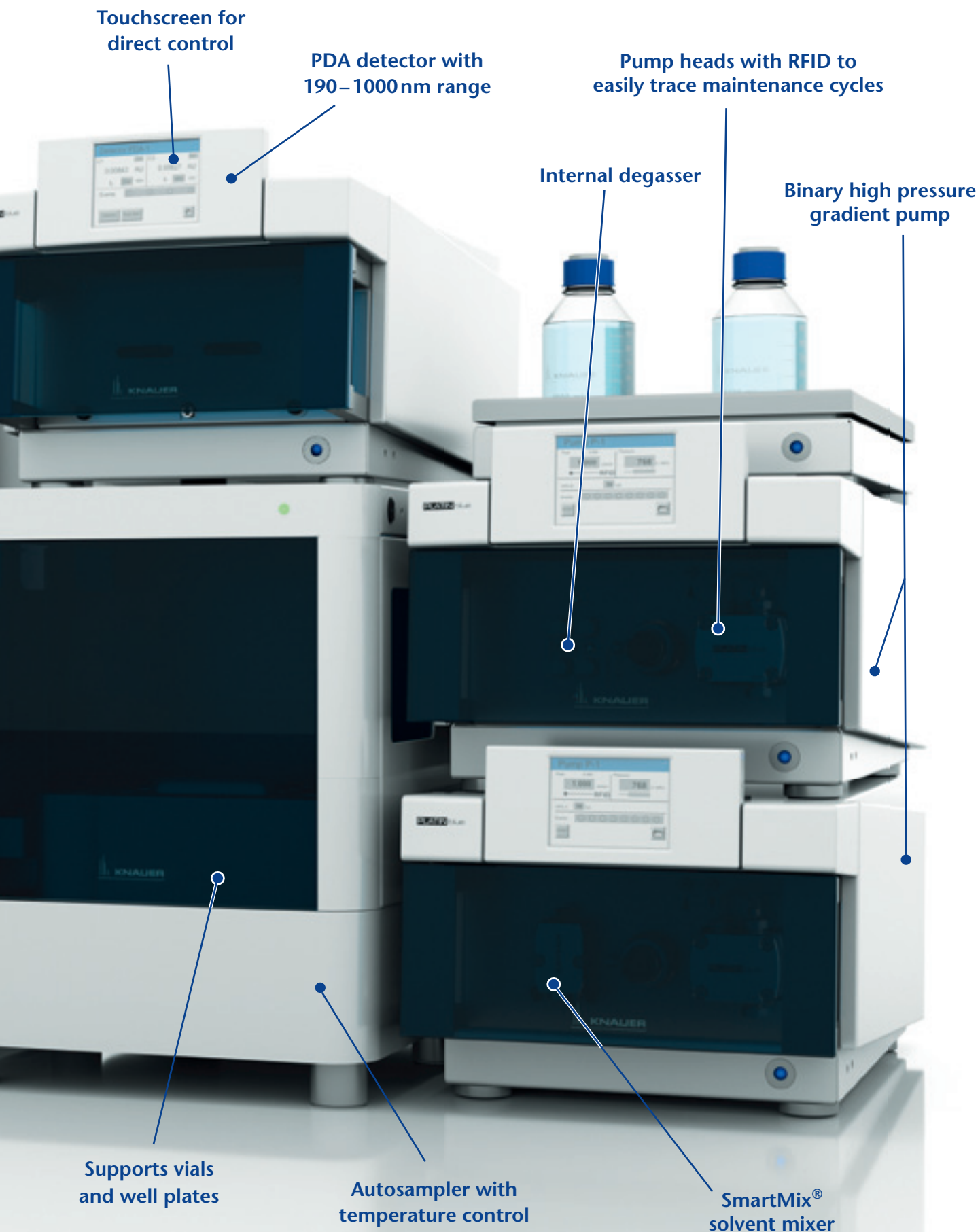
- ▶ Binary high pressure gradient for ultra fast composition changes
- ▶ Quaternary low pressure gradient (standard with HPLC Plus)

PLATINblue
by Knauer

Column selection
valves for 6 columns

Column
thermostat

Column RFID



How often do you wish for higher LC resolution?

Analytical tasks can be a real challenge and sometimes method optimizing is limited in its success. The PLATINblue family of liquid chromatography instruments was designed to offer superior results not only in terms of resolution and throughput, but also in terms of reliability, operating costs and ease-of-use. With HPLC Plus you can enter premium HPLC and upgrade from 750 to 1000 bar later.

Freedom of choice

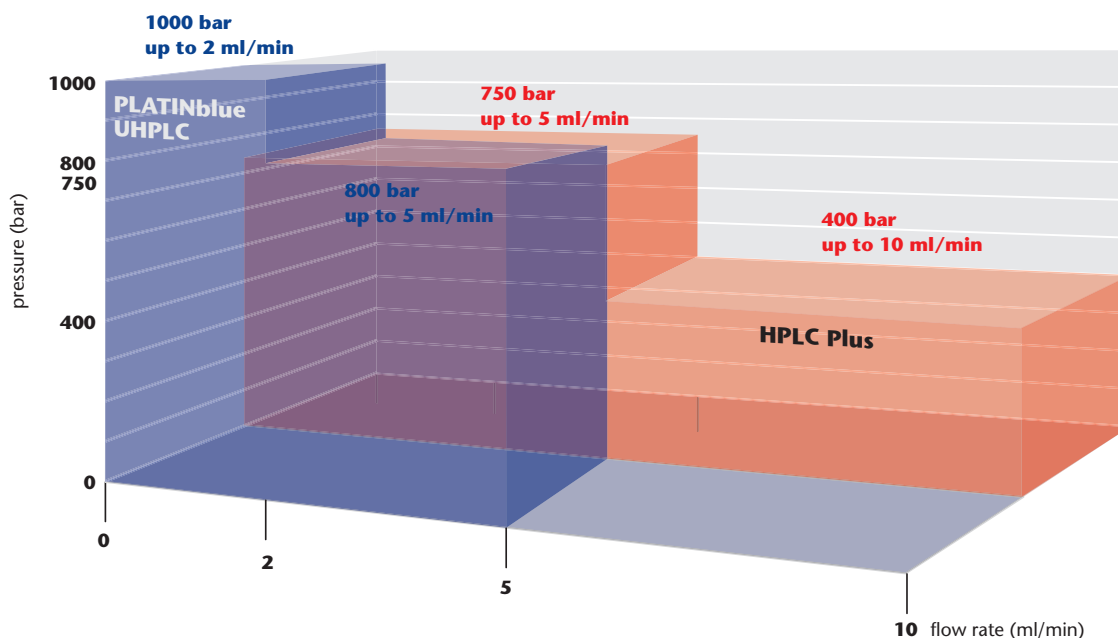
Depending on your lab's current application focus we offer two versions of PLATINblue premium liquid chromatography systems:

▶ PLATINblue UHPLC

- Ultimate performance with sub-2 μm fully porous and core-shell columns
- Up to 1000 bar
- Highest sensitivity, ideal for MS

▶ PLATINblue HPLC Plus

- Routine HPLC up to 750 bar
- Upgradeable to UHPLC at any time
- Most affordable PLATINblue solution



PLATINblue features one of the widest flow rate ranges available for unsurpassed compatibility with practically any LC application

What is your analytical challenge today?

Environmental

Determination of phthalates



Separation column

BlueOrchid C18 1.8µm, 100x2mm

Separation conditions

Eluent: A: H₂O / ACN 15:85
B: ACN

Gradient: 0.0–1.2 min 0% B
1.2–3.2 min 0%–100% B
3.2–5.0 min 100% B

Flow rate: 0.5 ml/min

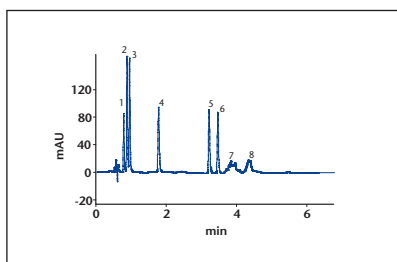
Mode: RP-Mode, gradient

Injection volume: 2µl

Pressure: 350 bar (5080 psi)

Detection: 225 nm (50 Hz, 0.05 s)
10 mm, 2µl flow cell

Temperature: 30 °C



- 1 Benzylbenzoate (IS)
- 2 BBP
- 3 DBP
- 4 DHP
- 5 DEHP
- 6 DNOP
- 7 DINP
- 8 DIDP

Food

Determination of coumarin



Separation column

BlueOrchid C18 1.8µm, 100x2mm

Separation conditions

Eluent: A: H₂O
B: MeOH

Gradient: 0.0–4.6 min 50–70% B
4.6–4.7 min 70–95% B
4.7–5.95 min 95% B
5.95–6.0 min 95–50% B

Flow rate: 0.3 ml/min

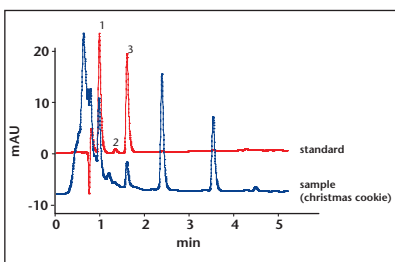
Mode: RP-Mode, gradient

Injection volume: 2µl

Pressure: 520 bar (7540 psi)

Detection: UV, 278 nm (50 Hz, 0.02 s)
10 mm, 2µl flow cell

Temperature: 30 °C



- 1 Impurity I
- 2 Impurity II
- 3 Coumarin

Clinical

Separation of tt-muconic acid in urine (I)



Separation column

BlueOrchid C18 A 1.8µm, 100x2mm
Phenyl 1.8µm 100 x 2mm (column tandem)

Separation conditions

Eluent: A: H₂O (1% HAc) B: MeOH

Gradient: 0–7.5 min 5% B–25% B
7.5–7.6 min 25% B–90% B
7.6–9.5 min 90% B
9.5–9.6 min 90% B–5% B

Flow rate: 0.4 ml/min

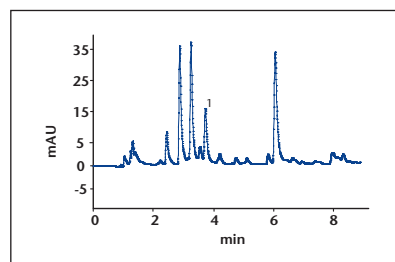
Mode: RP-Mode, gradient

Injection volume: 10µl

Pressure: 590 bar (8560 psi)

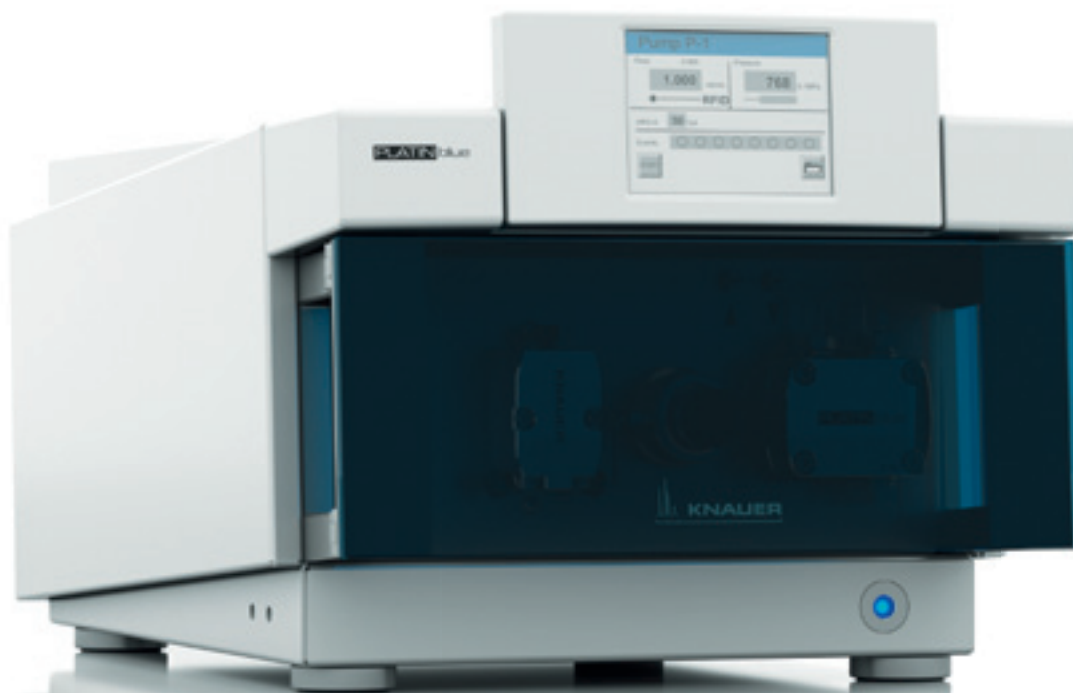
Detection: PDA-1, 259 nm (50 Hz)
10 mm, 2µl flow cell;

Temperature: 40 °C



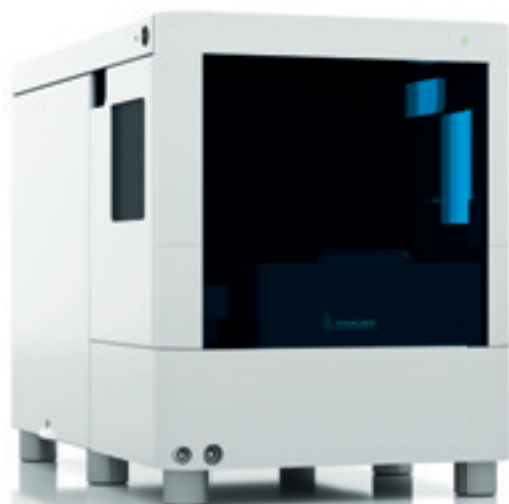
- 1 tt-Muconic acid

PLATINblue components



► PLATINblue P-1 Ultra High Pressure Pump

The PLATINblue P-1 pump has been optimized for ultra high performance and fast liquid chromatography applications. This UHPLC pump is capable of pressures up to 1000 bar (15000 psi) and flow rates up to 5 ml/min. The electronically controlled pump drive provides for low pulsation, a highly precise flow rate and a stable baseline.



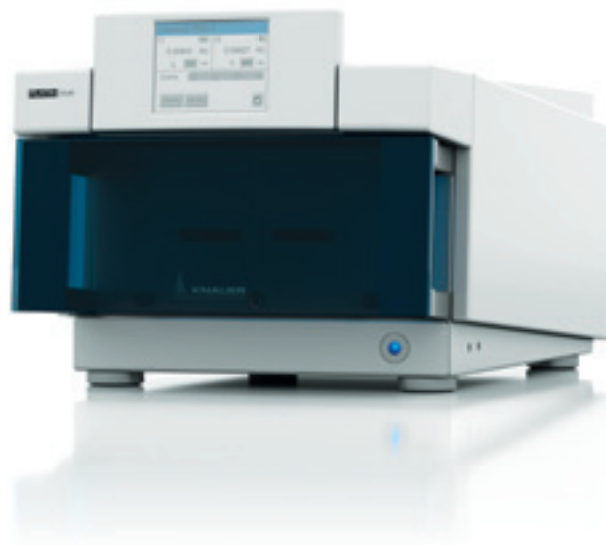
► PLATINblue AS-1 Autosampler

Inject samples from well plates and standard vials accurately and fast with this UHPLC autosampler, which can handle pressures up to 1000 bar (15000 psi). Supports full and partial loopfill injection as well as "microliter-pickup" for flexible selection of injection volumes. The tray cooling option allows for engeres spacing-sensitive samples.

▶ PLATINblue PDA-1

Diode Array Detector

This very sensitive diode array detector with a data acquisition rate of up to 100 Hz with dual-lamp configuration has a wavelength range from 190 to 1000 nm. New ultra sensitive fiber optical flow cell provides for highest detection performance. Use spectrum data to determine peak purity or to facilitate the identification of unknown substances.



▶ PLATINblue T-1

Column Thermostat

This column thermostat can accommodate up to six HPLC columns and ensures stable temperature conditions in the range of 5 to 80 °C. The eluent is cooled before reaching the detector to minimize noise and drift. It also features RFID column recognition for up to six columns and has two valves for advanced switching tasks.

▶ Expression CMS

Compact Mass Spectrometer

The expression CMS is a fast and easy to use mass spectrometer, which is just 28 cm wide and 56 cm deep – small enough to fit on any lab bench. This attractively priced mass detector offers ESI with APCI option as ion source and achieves a resolution of ~0.7 m/z. The expression CMS can be easily combined with KNAUER LC systems for analytical applications and preparative tasks such as mass directed/mass confirmed fraction collection.



For more information



www.knauer.net/platinblue



AZURA

Preparative HPLC

What do you want
to purify today?



Eluent tray

Variable wave-
length UV/VIS
detector

Side-panels
available in
different colors

Demountable control unit
with touchscreen

AZURA

Preparative HPLC

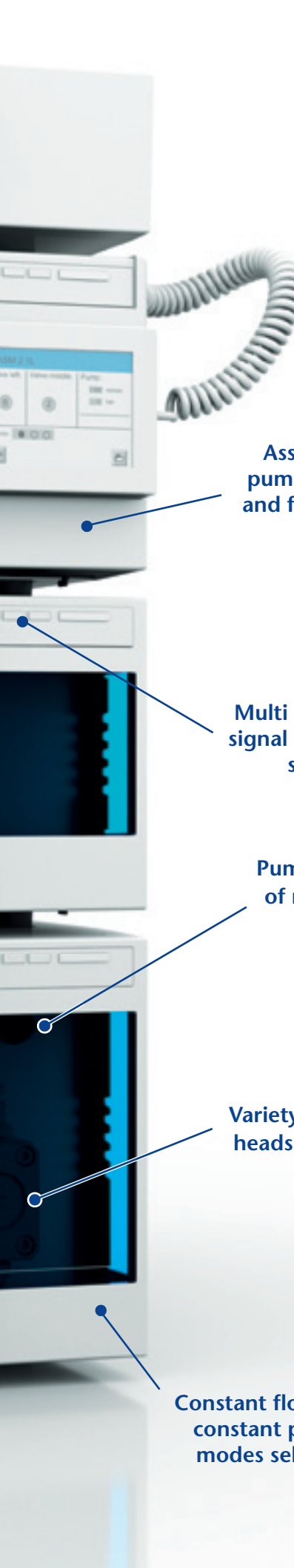
A preparative HPLC system should be as versatile as possible, since purification tasks can change frequently.

AZURA Preparative HPLC was designed for flexibility and to comfortably handle large sample volumes. Extensive automation makes fraction collection easy and allows solvent as well as peak recycling.

AZURA Preparative HPLC features

- ▶ Purification of milligram to gram samples
- ▶ Isocratic, binary or ternary gradient configurations
- ▶ Wide range of flow rates (0.1 – 1000 ml/min)
- ▶ Automatic RFID pump head recognition
- ▶ Fractionation valve for fraction collection, solvent and peak recycling
- ▶ Injection valve and feed pump for automated injection of large sample volumes
- ▶ Optional control unit allows direct control of AZURA L devices
- ▶ Leakage protection
- ▶ Leak monitoring

Azura made in germany



Assistant with feed pump, injection valve, and fractionation valve

Multi color LEDs signal instrument status

Pump with a flow rate of max. 1000 ml/min

Variety of pump heads available

Constant flow rate or constant pressure modes selectable

AZURA

Preparative HPLC

The AZURA preparative HPLC system can be customized for individual applications due to its modular design.

Gradient capability with either high pressure mixing or low pressure mixing is easily upgradable. All AZURA HPLC systems feature sophisticated leak management. Leaked liquid is collected and the integrated leak sensor stops your system immediately after detecting the leakage.

The pump AZURA P 2.1L covers a wide flow rate range and pressure capacity. The automatic RFID pump head recognition allows quick adaption of the pump for various applications while keeping track of GLP data.

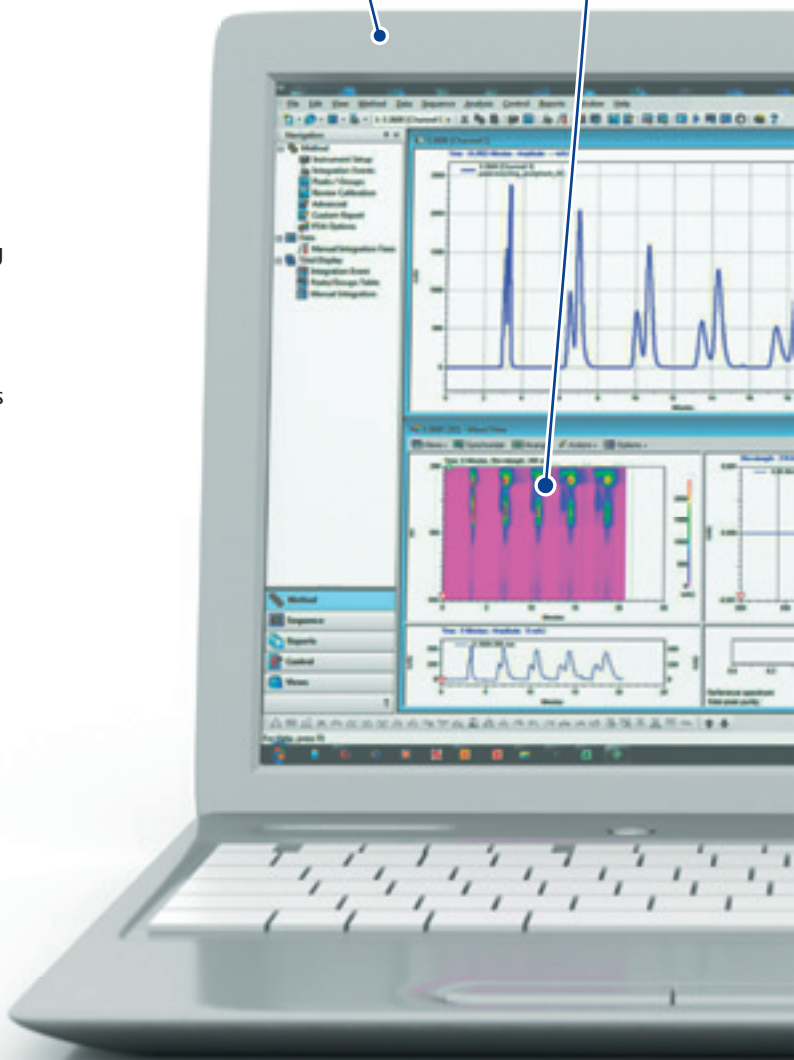
The UVD 2.1L is a variable wavelength UV/VIS detector, that can be adapted to a wide range of flow rates and path lengths. A fiber optics version is available, enabling to mount the flow cell directly at the column outlet.

A key component of these systems is the AZURA assistant for preparative HPLC. It is based on the multifunctional AZURA element ASM 2.1L and contains three integrated modules for automatic injection and fraction collection:

- ▶ Large sample volumes can be applied automatically via the integrated feed pump and electrical injection valve.
- ▶ The fractionation valve enables sample fractionation without an additional fraction collector.
- ▶ The electrical valves can also be facilitated to save solvent and for peak recycling.

Fraction collection can be controlled by time (volume), level, slope, and spectra comparison

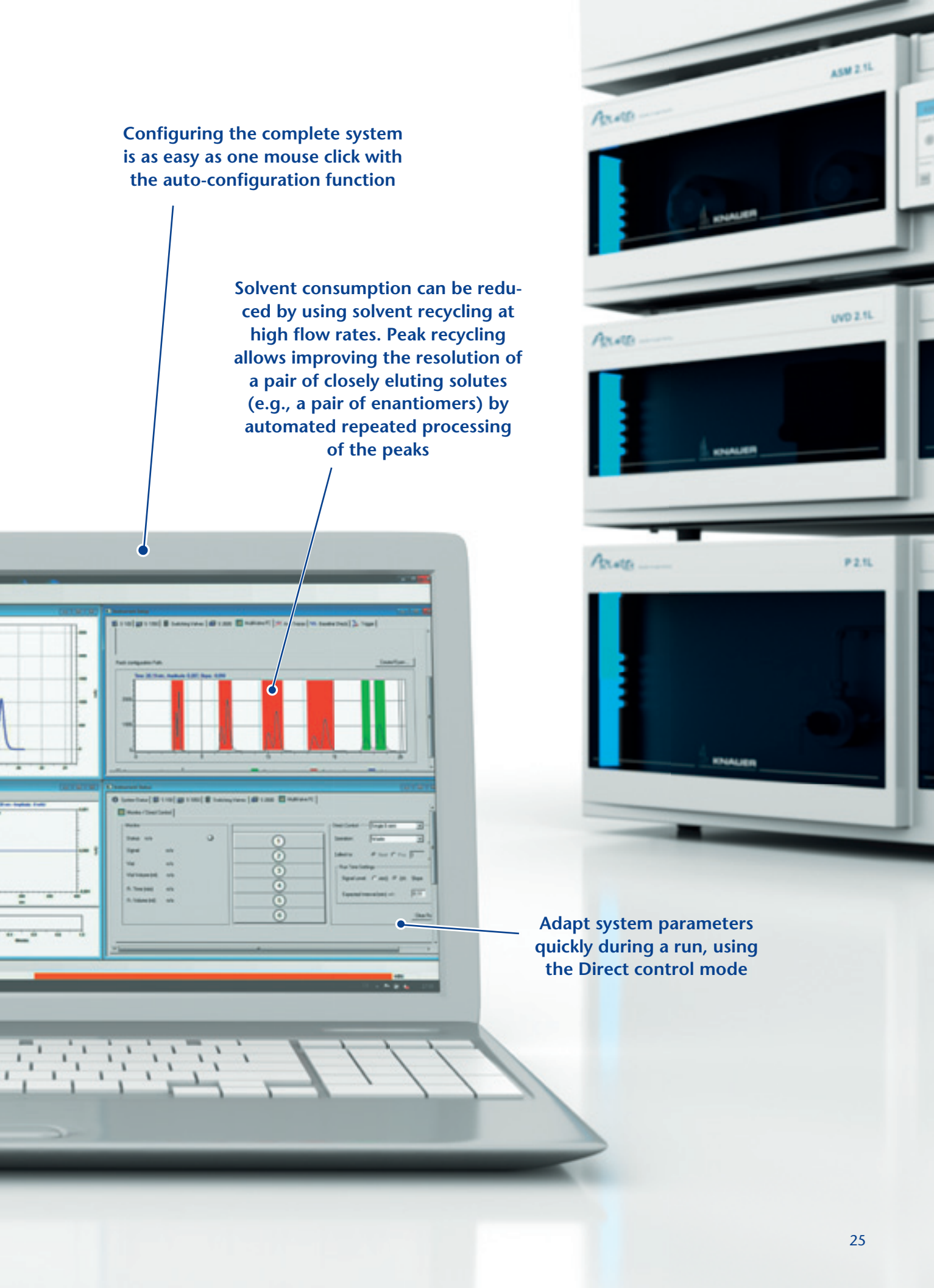
Productivity can be maximized with the integrated Stacked Injection feature



Configuring the complete system is as easy as one mouse click with the auto-configuration function

Solvent consumption can be reduced by using solvent recycling at high flow rates. Peak recycling allows improving the resolution of a pair of closely eluting solutes (e.g., a pair of enantiomers) by automated repeated processing of the peaks

Adapt system parameters quickly during a run, using the Direct control mode



What do you need for preparative HPLC?



► AZURA P 2.1L Pump for preparative HPLC

- Flow rate range: 0.1 – 1000 ml/min
- Automatic recognition of pump heads via RFID
- Constant flow rate mode for HPLC operation
- Constant pressure operation mode for high pressure dosing applications
- Pump heads: 100, 250, 500 and 1000 ml/min (stainless steel or titanium)
- Gradient options: binary high pressure blending with additional P 2.1L or cost-effective low pressure blending

For more information



www.knauer.net/azuraprep

▶ AZURA ASM 2.1L

Multifunctional device for preparative HPLC

- Three functional units combinable
- Can be equipped with pump, valve, detector, and degasser

▶ AZURA UVD 2.1L

Variable wavelength UV/VIS detector

- Flow rates up to 10.000 ml/min
- Fiber optics version for remote flow cell placement available
- Large variety of flow cells available
- Gradient options: binary high pressure blending with additional P 2.1L or cost-effective low pressure blending



AZURA preparative applications

Scale-Up (Stage I)

Isocratic separation, 10 mg/ml, no overloading

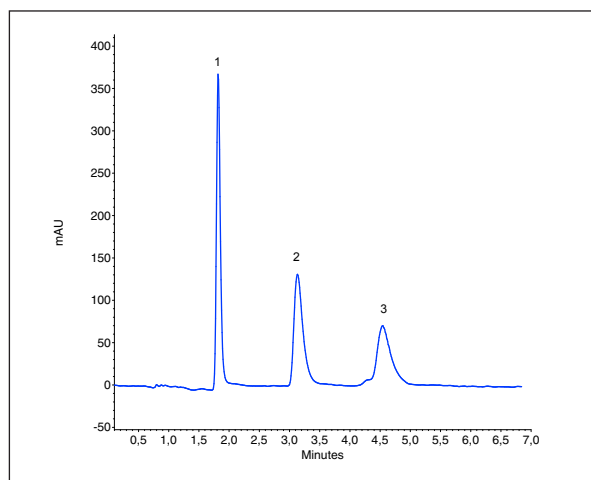


Separation column

Eurospher II 100-10 C18, 150 x 30 mm ID Vertex Plus AX

Separation conditions

| | |
|-------------------|---|
| Eluent: | 30 % Water; 70 % Methanol |
| Gradient: | isocratic |
| Flow rate: | 56 ml/min |
| Mode: | RP-Mode, preparative |
| Injection volume: | 500 µl |
| Detection: | UV 220 nm (+/- 2 nm), 10 mm flow cell (recommended flow cell 3 mm) |
| Temperature: | ambient |



| | |
|---|----------------|
| 1 | Ethyl acetate |
| 2 | Butyl acetate |
| 3 | Pentyl acetate |

Scale-Up (Stage II)

Isocratic separation with overloading, 100 mg/ml

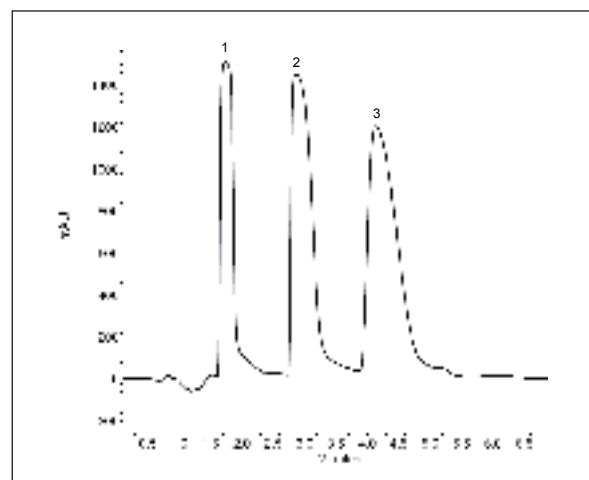


Separation column

Eurospher II 100-10 C18, 150 x 30 mm ID Vertex Plus AX

Separation conditions

| | |
|-------------------|---|
| Eluent: | 30 % Water; 70 % Methanol |
| Gradient: | isocratic |
| Flow rate: | 56 ml/min |
| Mode: | RP-Mode, preparative |
| Injection volume: | 1 ml |
| Detection: | UV 210 nm (+/- 4 nm), 10 mm flow cell (recommended flow cell 3 mm) |
| Temperature: | ambient |



| | |
|---|----------------|
| 1 | Ethyl acetate |
| 2 | Butyl acetate |
| 3 | Pentyl acetate |

Scale-Up (Stage III)

Gradient separation with severe overloading, 290 mg/ml

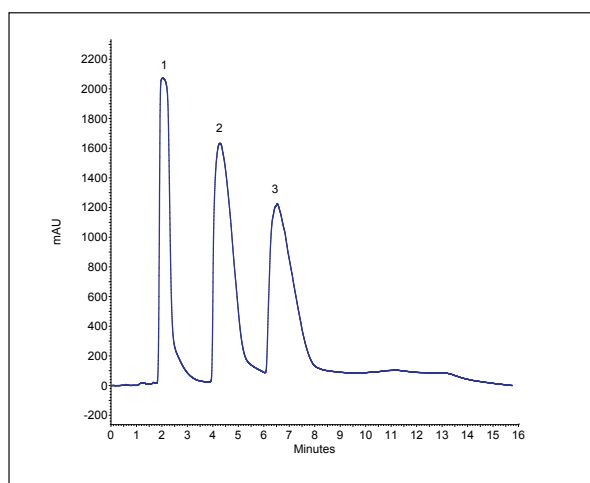


Separation column

Eurospher II 100-10 C18, 150x30 mm ID Vertex Plus AX

Separation conditions

| | | | |
|-------------------|---|------|----------|
| Eluent: | A Water; B Methanol | | |
| Gradient: | 0.0 min | 45 % | A 55 % B |
| | 2.0 min | 40 % | A 60 % B |
| | 3.0 min | 40 % | A 60 % B |
| | 5.0 min | 35 % | A 65 % B |
| | 6.5 min | 35 % | A 65 % B |
| | 10.0 min | 20 % | A 80 % B |
| | 12.0 min | 20 % | A 80 % B |
| | 15.0 min | 45 % | A 55 % B |
| | 16.0 min | 45 % | A 55 % B |
| Flow rate: | 56 ml/min | | |
| Mode: | RP-Mode, preparative | | |
| Injection volume: | 1 ml | | |
| Detection: | UV 210 nm (+/- 2 nm), 10 mm flow cell (recommended flow cell 3 mm) | | |
| Temperature: | ambient | | |



- 1 Ethyl acetate
- 2 Butyl acetate
- 3 Pentyl acetate

Food

Preparative separation of apple flavours from extract

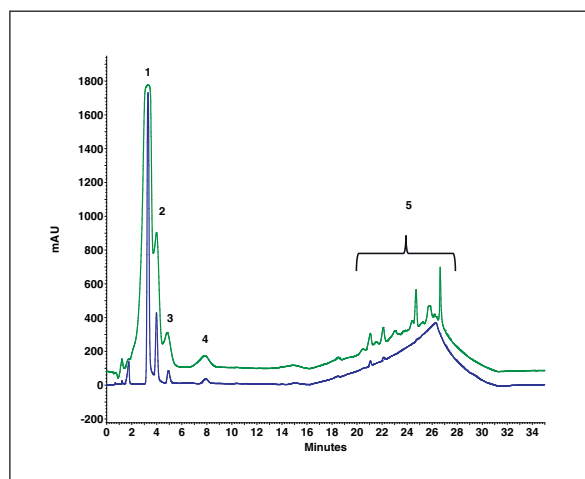


Separation column

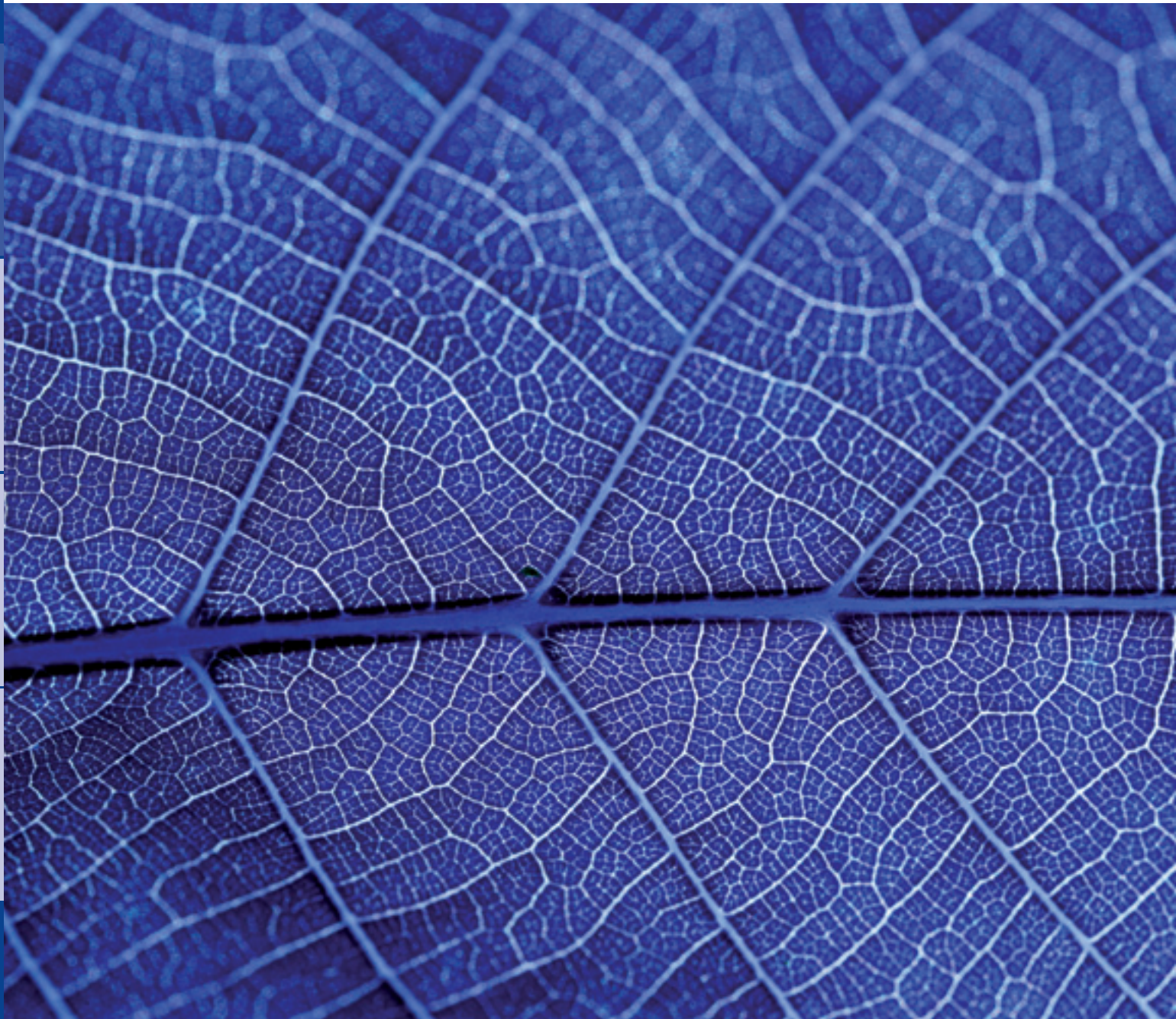
Eurospher II 100-10 C18, 150x20 mm ID Vertex Plus AX

Separation conditions

| | | | |
|-------------------|--------------------------------|------|-----------|
| Eluent: | A Water; B Ethanol | | |
| Gradient: | 0.0 min | 55 % | A 45 % B |
| | 15.0 min | 55 % | A 45 % B |
| | 25.0 min | 0 % | A 100 % B |
| | 30.0 min | 55 % | A 45 % B |
| | 35.0 min | 55 % | A 45 % B |
| Flow rate: | 25 ml/min | | |
| Mode: | RP-Mode, preparative | | |
| Injection volume: | 200 µl (blue); 1000 µl (green) | | |
| Detection: | UV 200 nm, 3 mm flow cell | | |
| Temperature: | ambient | | |



- 1 trans-2-Hexen-1-al
- 2 trans-2-Hexen-1-ol
- 3 Methyl 2-methylbutyrate, Ethyl isobutyrate, Ethyl butyrate, n-Butyl acetate
- 4 Ethyl 2-methylbutyrate, Ethyl valerate, 3-Methylbutyl acetate, 2-Methylbutyl acetate
- 5 other compounds (elution with higher Ethanol concentration)



AZURA

Compact HPLC

How much space does
your HPLC need on
your lab bench?



AZURA

Compact HPLC

How much chromatography equipment fits into a cuboid of 36x16x52cm (W×H×D)? We at KNAUER think that this should be enough space for a whole HPLC system. Just one L-sized AZURA element is required to run isocratic HPLC methods with UV detection, a configuration which is well-suited for many standard applications. AZURA Compact HPLC can be easily supplemented with options for eluent supply (e.g. gradient), injection, and fraction collection allowing for higher levels of automation and performance. This small and basic HPLC system still includes latest technology and we don't compromise on highest quality standards. We know that in the end of the day, we can only convince you with perfect results.

AZURA Compact HPLC features

- ▶ Isocratic HPLC in one box
- ▶ Space saving and customizable HPLC solution for your lab
- ▶ Software controlled – touchscreen control unit optionally available

Azura made in germany





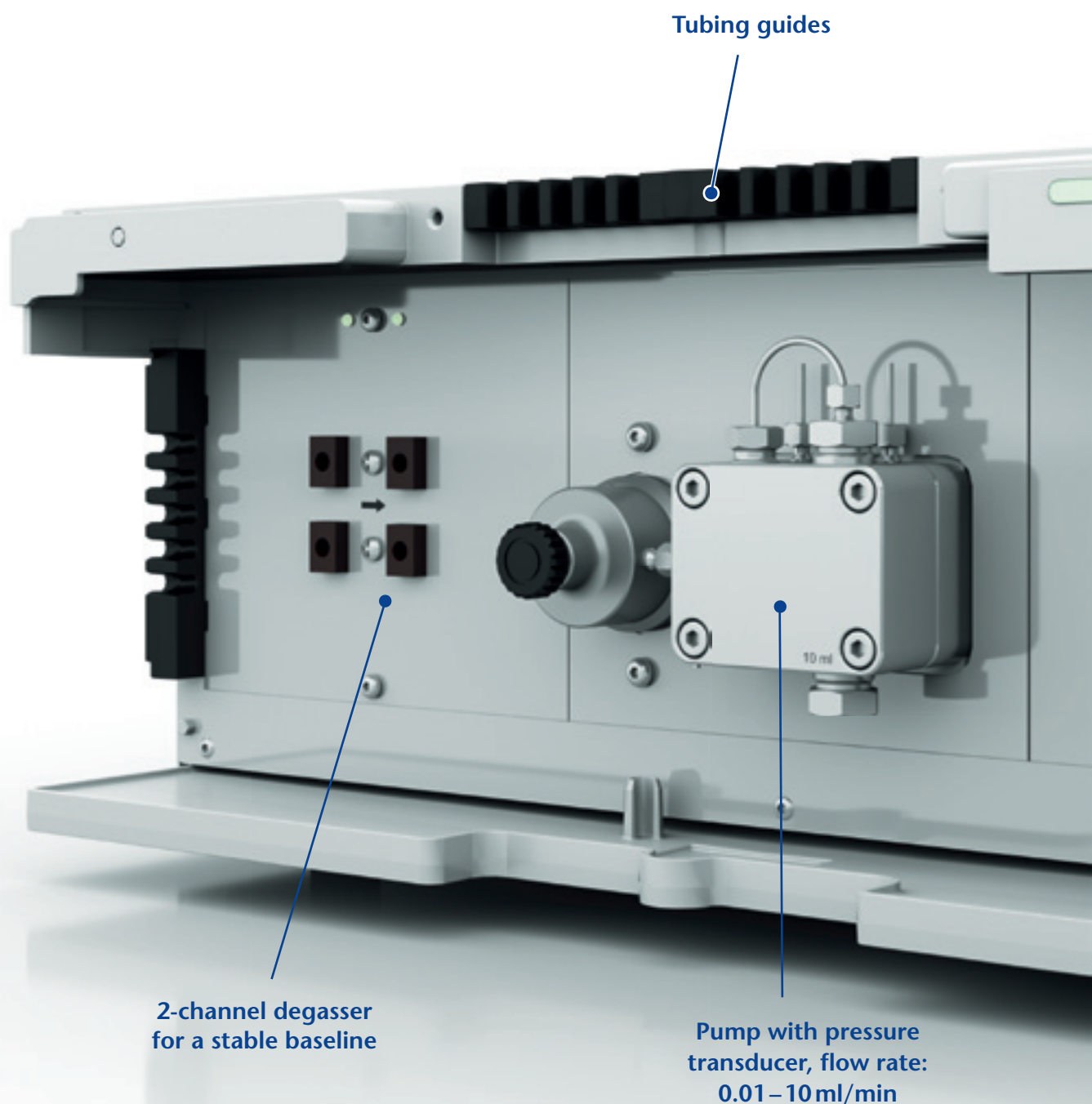
ASM 2.1L

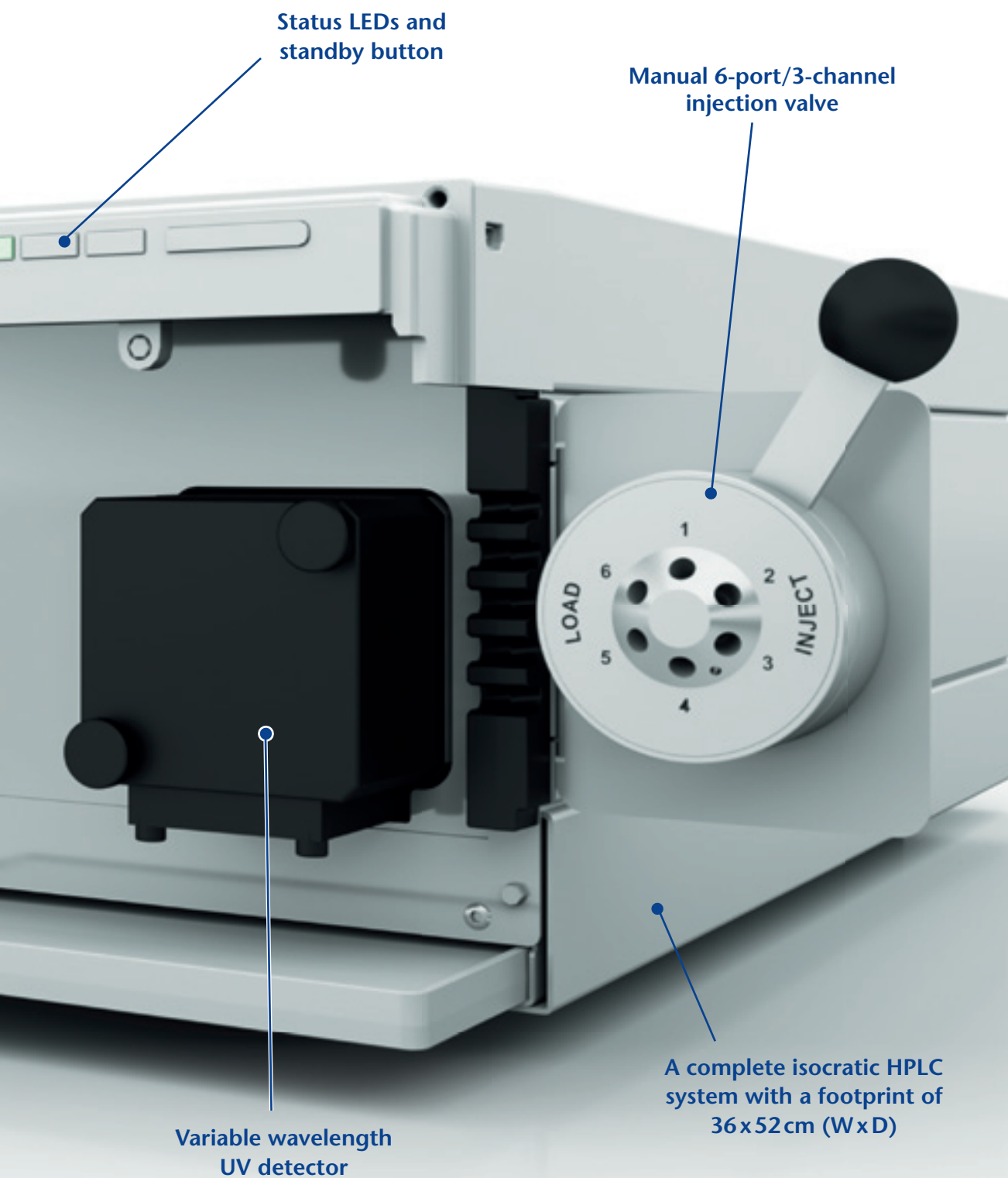
For more information



www.knauer.net/azuracompact

AZURA Compact HPLC details





AZURA Compact HPLC apps

Environmental

Separation of Endocrine disruptors



Separation column

BlueShell classic 80-4.5 C8 core-shell, 150 x 3 mm ID

Separation conditions

| | | |
|-----------|-------------------------|----------|
| Eluent: | A Water; B Acetonitrile | |
| Gradient: | 0.0–4.5 min | 30–40% B |
| | 4.5–4.6 min | 40% B |

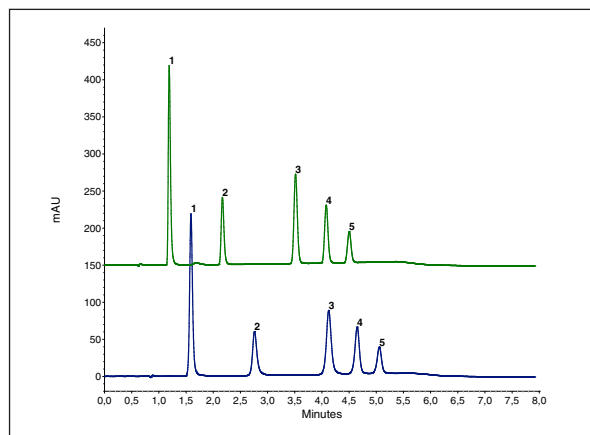
Flow rate: 1.0 ml/min

Mode: RP-Mode

Injection volume: 1 µl

Detection: UVD 2.1L with 10 mm flow cell: 220 nm, 20 Hz, 0,05 s

Temperature: 25 °C



- 1 Desethyl atrazine
- 2 Simazine
- 3 Atrazine
- 4 Diuron
- 5 Bisphenol A

Food

Determination of water soluble Vitamins



Separation column

Eurospher II 100-5 HILIC, 150 x 3 mm ID

Separation conditions

| | | |
|-----------|---|----------|
| Eluent: | A: 25 mM NH ₄ -acetate pH 4, B: Acetonitrile | |
| Gradient: | 0.0–0.7 min | 20% A |
| | 0.7–1.4 min | 20–30% A |
| | 1.4–5 min | 30% A |

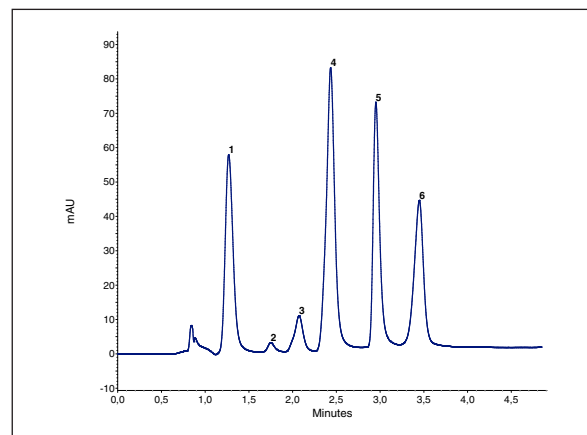
Flow rate: 1.0 ml/min

Mode: RP-Mode, preparative

Injection volume: 10 µl

Detection: UVD 2.1L with 10 mm flow cell: 254 nm, 20 Hz, 0,5 s

Temperature: 25 °C



- 1 Pyridoxal
- 2 Folic acid
- 3 Ascorbic acid
- 4 Nicotinic acid
- 5 Thiamine
- 6 Cyanocobalamin

Food

Separation of fat soluble Vitamins

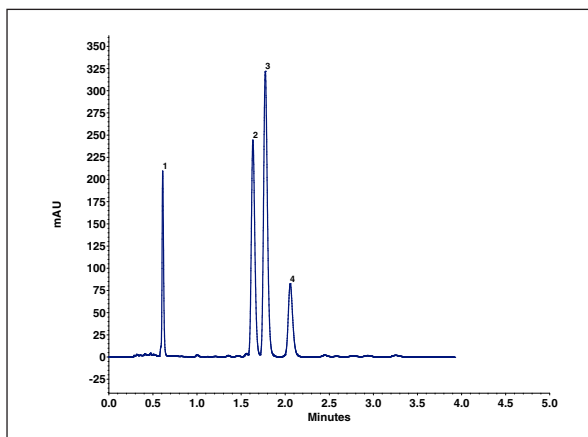


Separation column

BlueShell classic 80-4.5 C18 core-shell, 150 x 3 mm ID

Separation conditions

| | |
|-------------------|--|
| Eluent: | A: ACN/MeOH 80:20 (v/v) |
| Gradient: | Isocratic 100 % A |
| Flow rate: | 1.0 ml/min |
| Mode: | RP-Mode |
| Injection volume: | 1 µl |
| Detection: | UVD 2.1L with 10 mm flow cell: 280 nm, 20 Hz, 0,05 s |
| Temperature: | 25 °C |



- 1 Vitamin A-acetate
- 2 Vitamin D₂
- 3 Vitamin D₃
- 4 Vitamin E

Pharmaceutical

Separation of Hydroxybenzoic acids

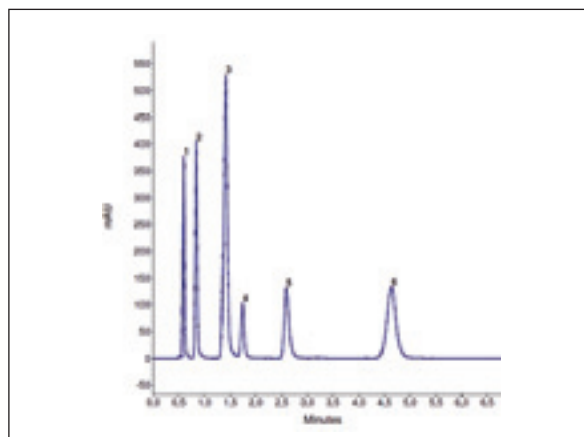


Separation column

Eurospher II 100-5 HILIC, 150 x 3 mm ID

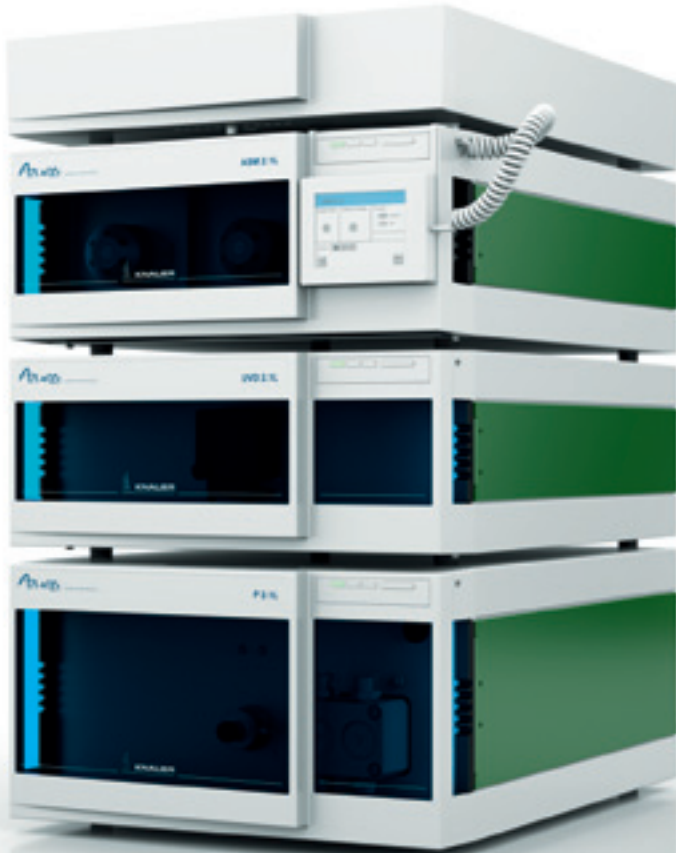
Separation conditions

| | |
|-------------------|---|
| Eluent: | A: 5 mM NH ₄ -acetate pH 4.78, B: Acetonitrile |
| Gradient: | Isocratic 90 % B |
| Flow rate: | 1.0 ml/min |
| Mode: | HILIC Mode |
| Injection volume: | 1 µl |
| Detection: | UVD 2.1L with 10 mm flow cell: 210 nm, 20 Hz, 0,05 s |
| Temperature: | 25 °C |



- 1 2,6-Dihydroxybenzoic acid
- 2 Salicylic acid
- 3 2,4-Dihydroxybenzoic acid
- 4 Benzoic acid
- 5 4-Hydroxybenzoic acid
- 6 3,5-Dihydroxybenzoic acid

Which color do you like?



Sparkling meadow



Melting copper



Imperial dignity

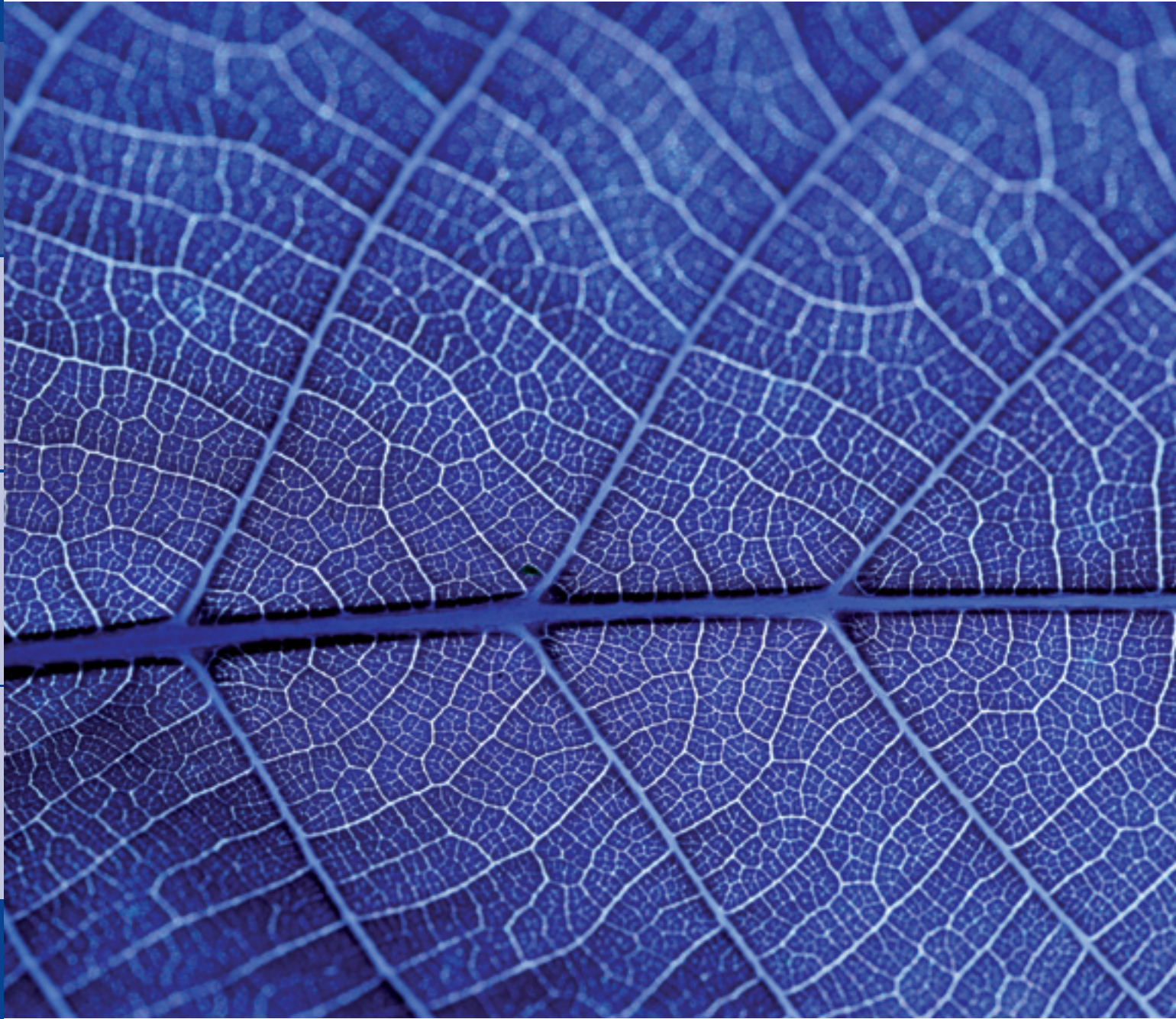


Deep sea



Twinkling starlight

With AZURA you can color up your lab. Modern design with completely demountable fronts and optionally colored side panels turn the system into a visual highlight. The standard version comes in the color "bright swan". If you want to assign your system to certain applications or want to generate a creative working environment, you may choose from colors: deep sea, sparkling meadow, imperial dignity, twinkling starlight or melting copper.



AZURA

S-sized elements

How flexible should
your HPLC be?



AZURA

S-sized elements

We love things that can be combined to create fascinating new things. This is true for cooking, for clothing, for playing with building blocks – so why not do the same with our HPLC elements? Flexibly group, stack, and combine AZURA elements to create your individual HPLC solution.

Although AZURA S-elements are small, they are very strong performers. The modules available in S-size include pumps, a detector, a degasser and valves for various tasks such as injecting and fraction collection, enabling very flexible solutions. With a footprint of just 12 x 19 cm (W x D) AZURA S-sized elements fit easily on every lab bench. They can be operated via software or via analog connection. KNAUER is known for providing smart and compact devices that are well-suited for many applications that require reliable and robust equipment – also apart from HPLC.

AZURA elements are highly adaptable due to a selection of:

- ▶ Pump heads: flow rate range and material
- ▶ Valve heads: switching options, inner diameter, and material
- ▶ Flow cells: sensitivity range, flow rate range and material



▶ AZURA P4.1S and P 2.1S Compact high pressure pump

AZURA P 4.1S pump was developed for eluent delivery up to 400 bars and for flow rates up to 50 ml/min in HPLC and other applications where a compact easy-to-integrate pump is required. The S-sized pumps are available with pressure transducer (P 4.1S) or without pressure transducer (P 2.1S).





▶ AZURA UVD 2.1S

Variable wavelength detector

The AZURA UVD 2.1S detector is a highly competitive HPLC detector for routine laboratory work. It offers excellent technical specifications and the typical reliability of KNAUER detectors. Its small footprint makes it one of the smallest variable wavelength UV detectors for HPLC on the market. The installed deuterium lamp covers a wavelength range from 190 to 500 nm.



▶ AZURA V 2.1S

Valve Drive

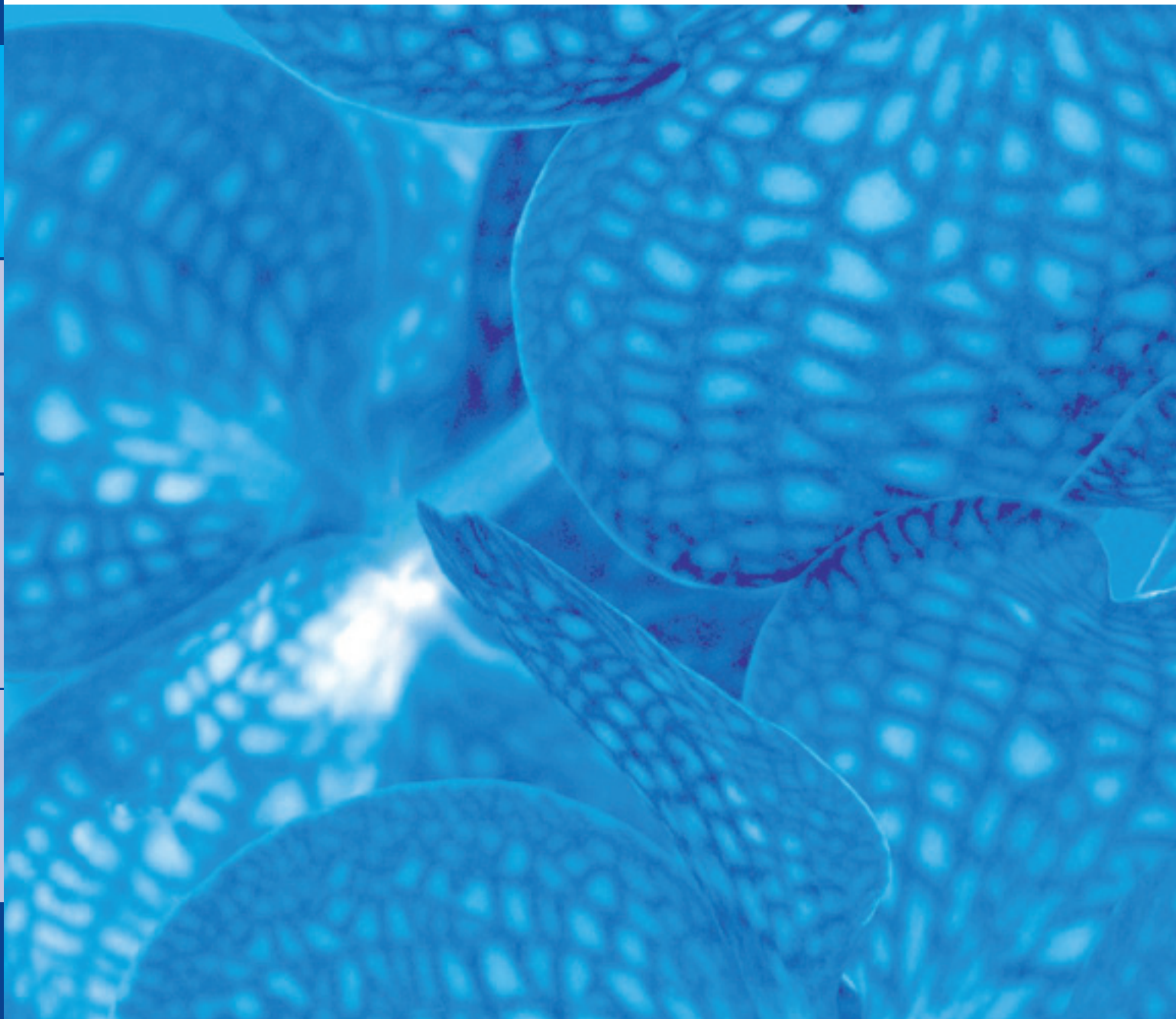
Valves are ubiquitous in all HPLC applications. Multi-position valves can be used for fraction collection, eluent selection or column switching. KNAUER offers a wide range of valve heads in different materials. The AZURA V 2.1S requires only little bench space. If more than one valve is needed for your application, up to three valve elements can be combined in a stackable AZURA ASM 2.1L device.



▶ AZURA DG 2.1

Degasser

Dissolved gases in the solvent can cause bubbles in pumps and the detector. Good chromatographic separation therefore requires degassing of the solvent. The small analytical 2-channel degasser DG 2.1S is equipped with two degassing chambers and can thus degas two solvents simultaneously.



HPLC columns

For a variety of applications

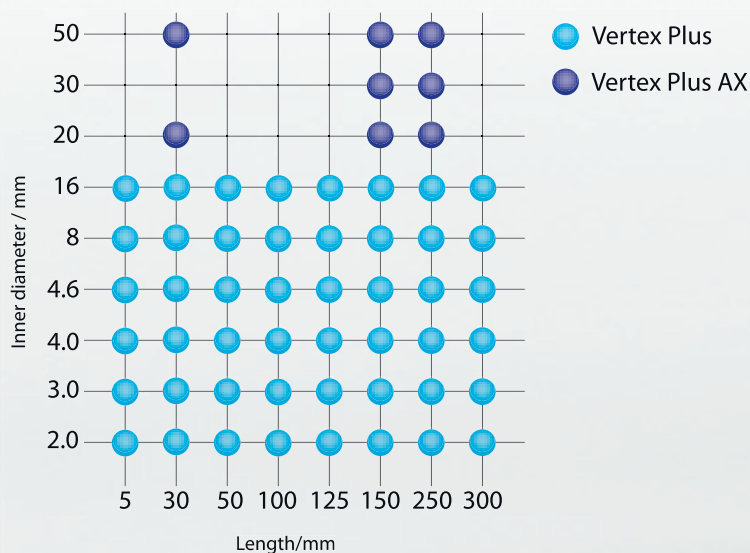
How do you find the
suitable column?



HPLC columns

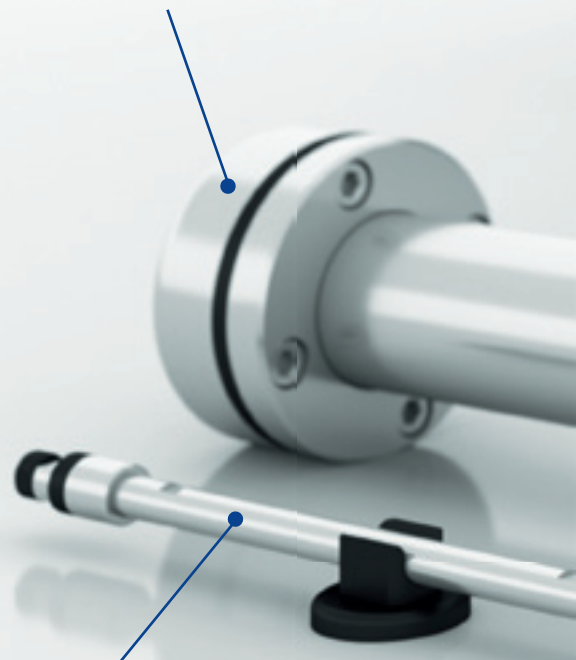
For a variety of applications

We are happy to support you in your decision making process to find the suitable column for your separation. Our experts have years of experience in analytical and preparative HPLC. Benefit from their knowledge to find the best columns for your separation task in chiral, chemical, pharmaceutical, bioscience, food, and environmental applications.



Available column dimensions

Vertex Plus AX preparative HPLC columns with axial bed compression



Vertex Plus analytical HPLC columns

All our HPLC columns at



www.knauer.net/columns



| |
|-----------------|
| C18 |
| C18A |
| C18H |
| C18P |
| C8 |
| C8AH |
| Phenyl |
| C4 |
| HILIC |
| NH ₂ |
| CN |
| Diol |
| Si |

Eurospher I+II

3 µm, 5 µm, 10 µm, 15 µm
for standard HPLC and HPLC Plus
price attractive working horse



www.knauer.net/eurospher

| |
|--------------|
| C18 |
| C18A |
| PFP |
| Phenyl-Hexyl |
| HILIC |

BlueShell

2.6 µm core-shell
for highest resolution
in HPLC and UHPLC



www.knauer.net/blueshell

| |
|-----------------|
| C18 |
| C18A |
| C18H |
| C8 |
| Phenyl |
| HILIC |
| NH ₂ |
| Si |

Bluespher

2 µm
for fast LC and UHPLC



www.knauer.net/bluespher

| |
|-----|
| C18 |
| C8 |

BlueShell classic

4.5 µm core-shell
for highest resolution in HPLC



www.knauer.net/bshellclassic

| |
|-----------------|
| C18 |
| C18A |
| C8 |
| PFP |
| Phenyl |
| C4 |
| CN |
| SAX |
| HILIC |
| PAL-HILIC |
| NH ₂ |
| Si |

BlueOrchid

1.8 µm
for high speed UHPLC

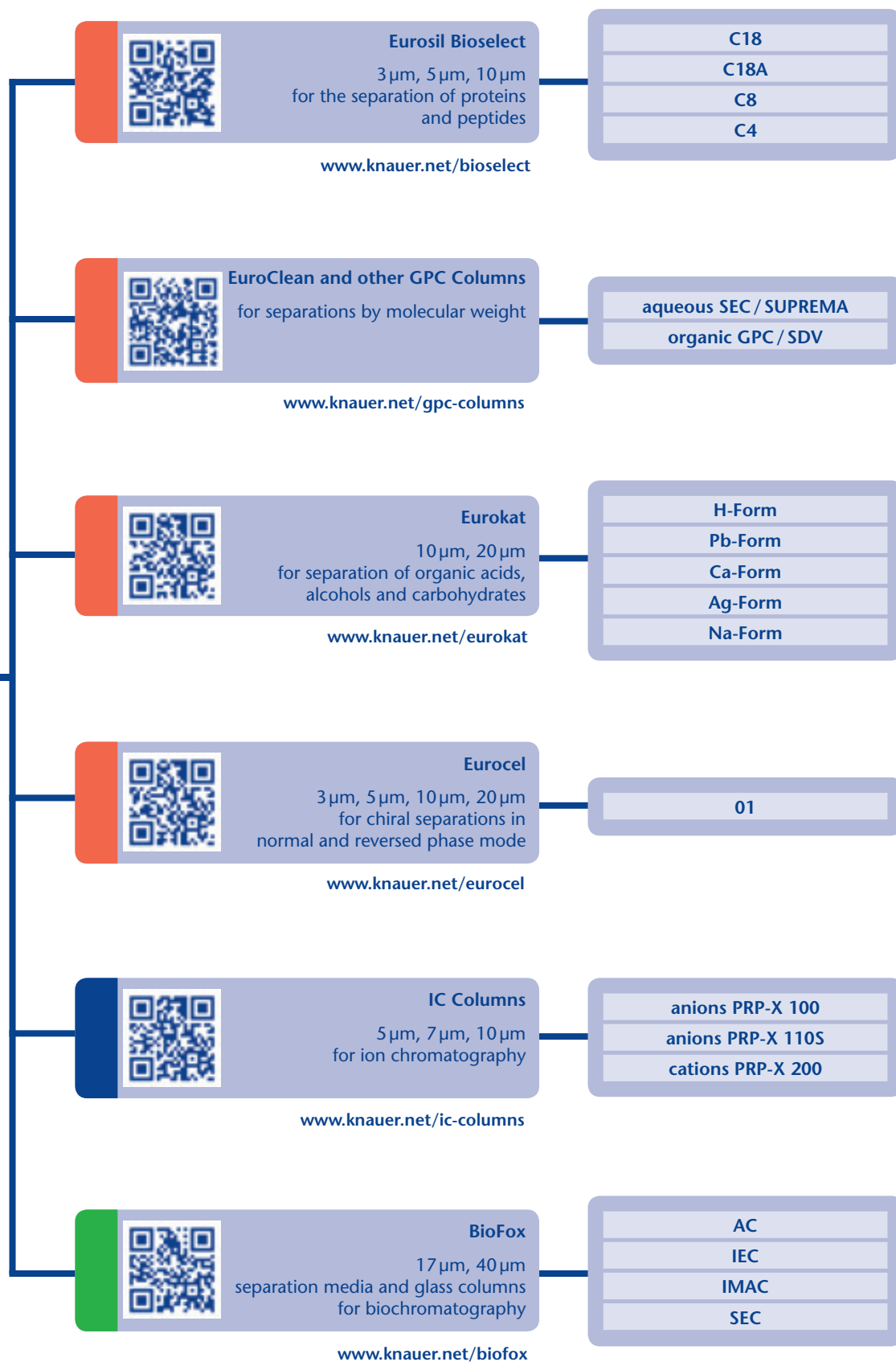
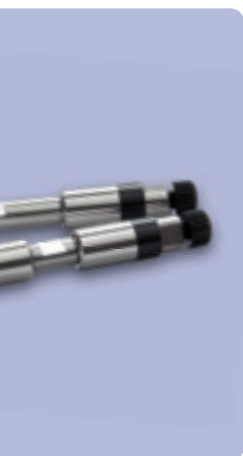


www.knauer.net/blueorchid



www.knauer.net/columns







Application support

KNAUER HPLC experts

Who is your
HPLC expert?

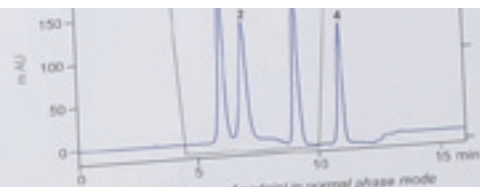


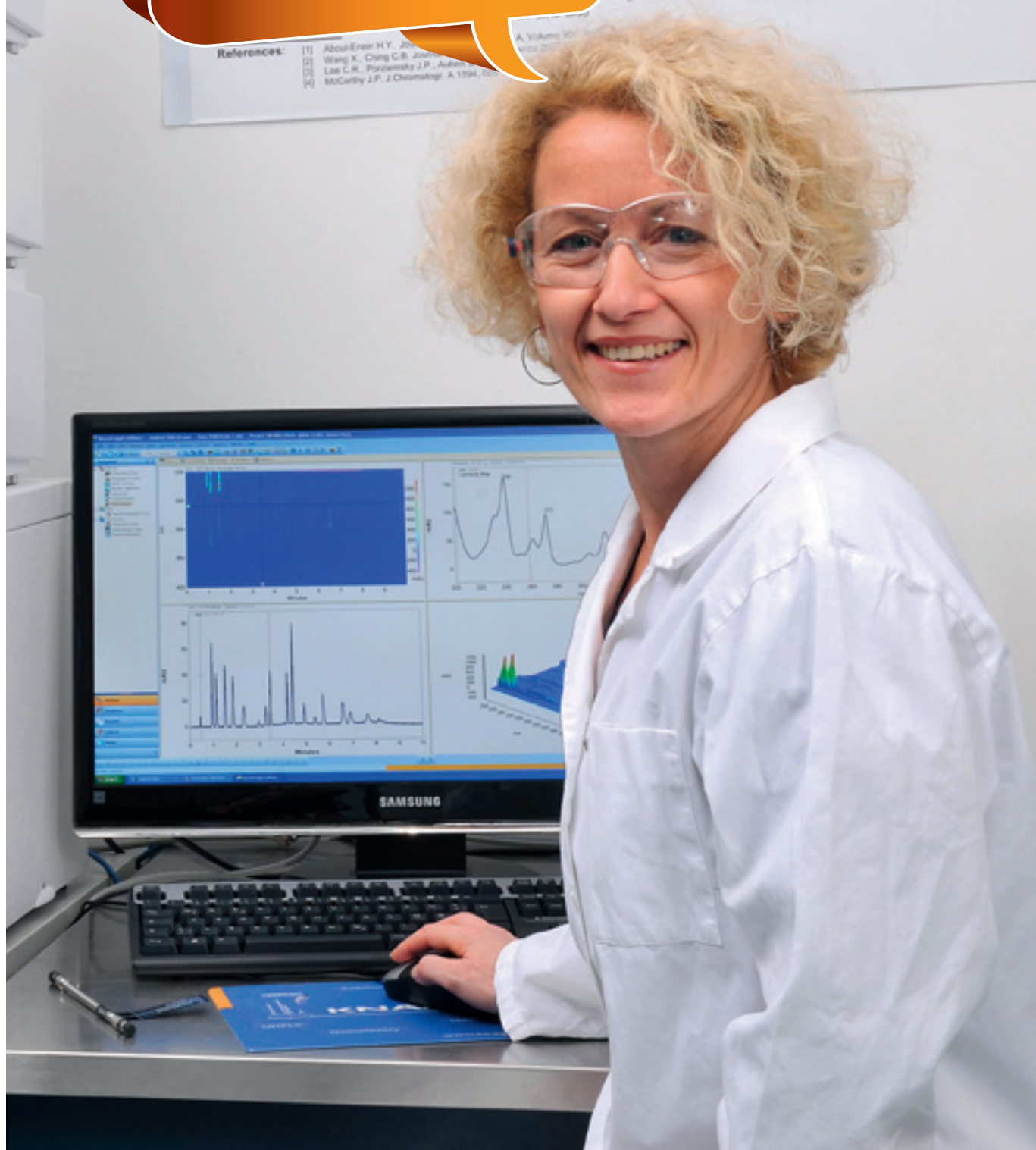
Fig. 3 Fast gradient separation of naldolol in normal phase mode with blank run subtracted

improved the peak shape and symmetry. Due to the large pore size of the chiral column material, the equilibration time after gradient elution should be considered.

References:

- [1] Aboul-Enein H.Y., J. Chromatogr. A, 1994, 651, 1-10
- [2] Wang X., Ching C.B., J. Chromatogr. A, 1994, 651, 11-18
- [3] Lee C.R., Porzemesky J.P., J. Chromatogr. A, 1994, 651, 19-26
- [4] McCarthy J.P., J. Chromatogr. A, 1994, 651, 27-34

A, Volume 651, 1-34, 1994



Application support

KNAUER HPLC experts

KNAUER's application lab provides a huge knowledge base for your separation challenges. Our application experts share their experience and most likely they have already solved some of your application challenges that you are facing right now. So first check our applications library for solutions.

Applications library

- ▶ Compact application notes (environmental, food, bioanalytical, chiral, pharmaceutical, and more...)
- ▶ Detailed application notes for selected topics
- ▶ Applications cover HPLC, UHPLC, sample preparation, and preparative HPLC techniques

Note: If you can't find the application you are looking for, don't hesitate to contact us, since our company's applications library is much larger than the web archive.

Access our applications library



www.knauer.net/applications



Quick
Guide

Applications

 **KNAUER**

UHPLC

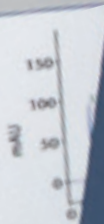
Environmental

Separation of benzene de



Separation column
BlueOrchid C18 1.8µm, 100

Separation conditions:
Eluent: ACN/H₂O
Flow rate: 1.0 ml/min
Mode: RP-MC
Injection volume: 1 µl
Pressure: 750 bar
Detection: MWD
Temperature: 35 °C



1 Thiou
2 Tolu
3 Prop
4 Buty

HPLC/UHPLC

Food

Determination of benzo



Separation column
BlueOrchid C18 1.8µm, 50

Separation conditions:
Eluent: A: Water
B: MeOH
Gradient: 0-2
2-3
3-3
Flow rate: 0.6 ml/min
Mode: RP-MC
Injection volume: 1 µl
Pressure: 62 bar
Detection: PDA
Temperature: 35 °C



1 Meth
2 Ethyl
3 Prop
4 Buty
5 Per

HPLC/UHPLC

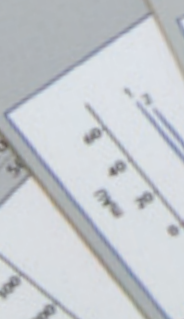
Bioanalytical

Determination of amino a



Separation column
BlueOrchid C18 1.8µm, 100

Separation conditions:
Eluent: A: Soda
B: ACN
Gradient: 0.0-
5.0-
6.0-
11.0
0.6 ml/min
Flow rate: 1.0 ml/min
Mode: RP-MC
Injection volume: 1 µl
Pressure: 826 bar
Detection: MWD
Temperature: 40 °C



1 Barbita
2 Lumina
3 Promet
4 Remo

of sedatives
ates



Separation column
BlueOrchid C18 1.8µm, 100

Separation conditions:
Eluent: A: 1.2 ml
B: ACN
Gradient: 0.0-0
0.3-2
0.8 ml/min
Flow rate: 1.0 ml/min
Mode: RP-MC
Injection volume: 1 µl
Pressure: 950 bar
Detection: MWD
Temperature: 35 °C

Separation column
BlueOrchid C18 1.8µm, 100

Separation conditions:
Eluent: A: 1.2 ml
B: ACN
Gradient: 0.0-0
0.3-2
0.8 ml/min
Flow rate: 1.0 ml/min
Mode: RP-MC
Injection volume: 1 µl
Pressure: 950 bar
Detection: MWD
Temperature: 35 °C

Separation column
BlueOrchid C18 1.8µm, 100

Separation conditions:
Eluent: A: 1.2 ml
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Gradient: 0.0-0
0.3-2
0.8 ml/min
Flow rate: 1.0 ml/min
Mode: RP-MC
Injection volume: 1 µl
Pressure: 950 bar
Detection: MWD
Temperature: 35 °C

Application support

KNAUER HPLC experts



How much does your HPLC method development cost?

Developing your own HPLC applications or optimizing existing methods is a tedious job. For many laboratories, this kind of work keeps staff from other more profitable tasks. Even if method development is not often on your to-do list, chances are you could benefit from the expertise of our application specialists. Why not get a quotation from us first, before you start experimenting with your next method development?



At what workload does your HPLC pay off?

KNAUER offers a custom-tailored analytical HPLC service. Depending upon the complexity of the separation task and the number of analyses required, we calculate a per analysis price and deliver fast and reliable results produced with the latest HPLC technology. You can save time and money by contracting out certain analysis tasks and keep your expenses predictable.

For more information



www.knauer.net/appsup

Is your current equipment fit for your purification task?

The equipment required for a given LC purification task can differ largely, depending upon purity and yield demands. Sometimes optimizing a batch HPLC method is sufficient, sometimes the problem requires a continuous HPLC approach. KNAUER offers both technologies and has experienced specialists, ready to take on your challenging purification task. We offer a competitive solution, keeping your LC costs under control.



How do you educate your HPLC operators?

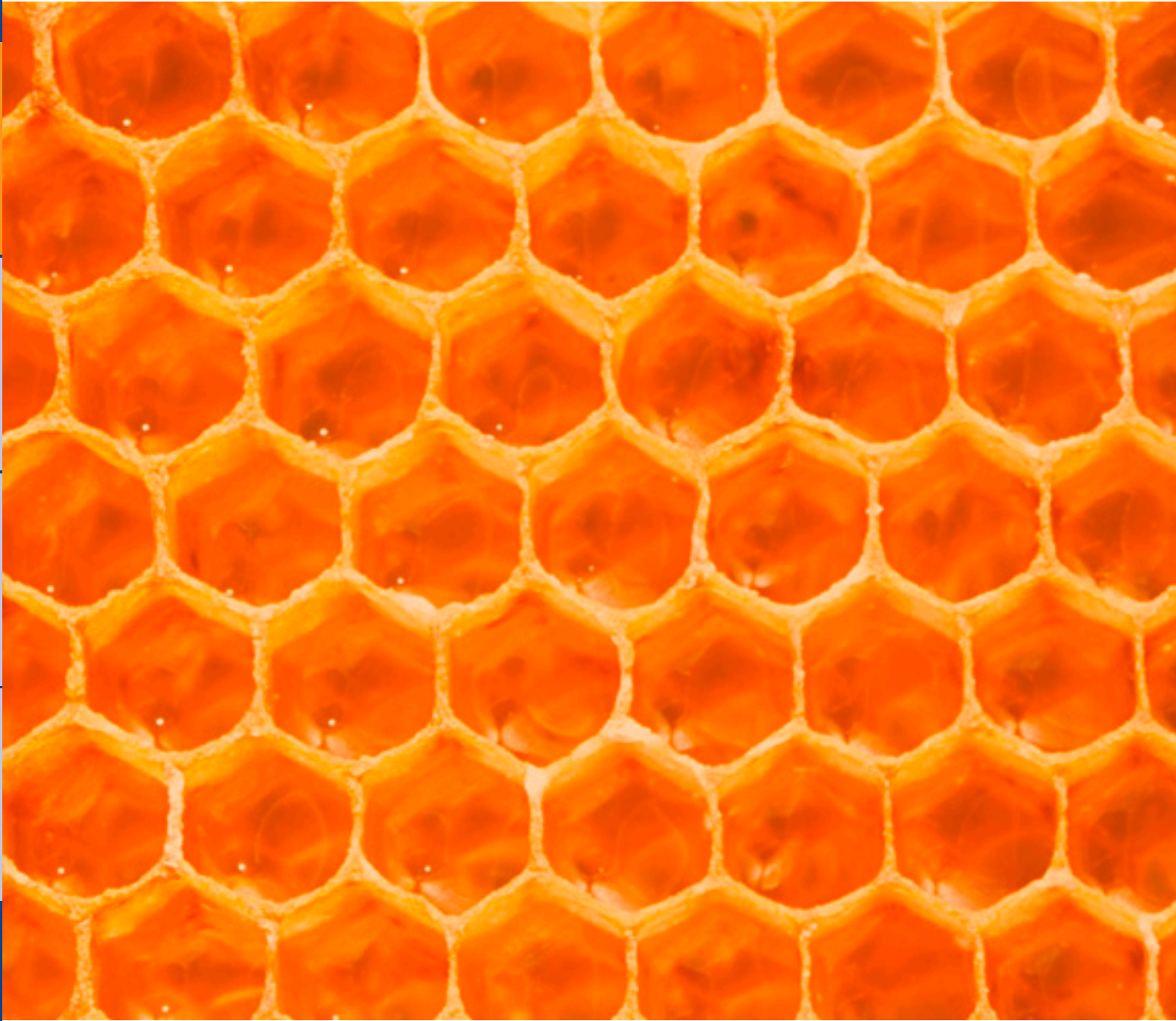
It is time-consuming to educate your staff in HPLC basics and develop your own team of HPLC experts. We offer customized HPLC and chromatography software training, ranging from beginners to experienced level courses. Our experts can teach according to your application focus. Training sessions can be held at KNAUER or on-site. Advance your lab's HPLC qualifications—request a quote today.



What's the column that you couldn't find?

We offer customized HPLC columns based on high performance KNAUER Vertex Plus hardware. Please refer to page 48 for a chart of the standard column hardware dimensions which we can fill with your column material. We have more than 25 years of column packing experience.





Software support

Software drivers,
firmware and software solutions

Where does software
limit you today?



Software support

Software drivers, firmware, and software solutions

Many of today's devices rely on some kind of software to run and interact with you, either internal software (firmware) or drivers and application software on your PC. To provide the most useful tools for your daily work, our team of software engineers combines its expertise in developing firmware, instrument control drivers, as well as application software. KNAUER also has a long experience in customizing instrument operation and in developing drivers for various OEM customers. Let us know of your software challenge – we will program a solution.

Freedom of choice

- ▶ Development of firmware for HPLC devices for
 - UHPLC and HPLC pumps
 - UV, PDA, RI, LS, and FL detectors
 - Autosamplers
 - Valves
 - Column ovens
 - Fraction collectors
- ▶ Development of device drivers for
 - OpenLAB
 - ChromGate (EZChrom based)
 - Chromeleon
 - Xcalibur
 - Analyst
 - HyStar
 - ClarityChrom (Clarity based)
- ▶ Automation of measurement and operation process
- ▶ Validation of chromatographic software and firmware





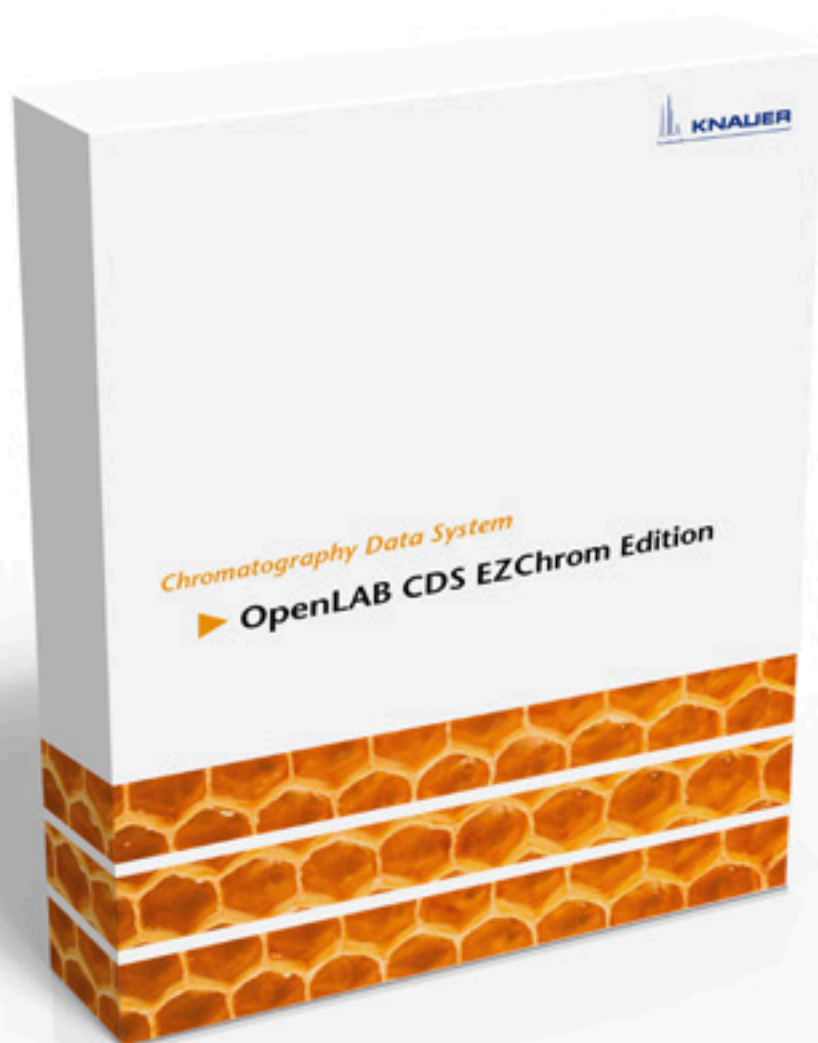
For more information



www.knauer.net/sw-support

Software solutions

Refining chromatography data systems (CDS)
with drivers and additional functions



► OpenLAB CDS EZChrom Edition^{*} Chromatography data system

OpenLAB EZChrom Edition CDS is the next generation of chromatography data systems and the successor of ChromGate. OpenLAB CDS EZChrom Edition provides chromatography data acquisition, processing and control of GC and LC chromatographs and is used in chromatography operations ranging from single user/single instrument to multi-user/multi-instrument laboratories. It provides support of devices from KNAUER and many other manufacturers.



► ClarityChrom CDS*

Chromatography data system

ClarityChrom is an easy-to-use chromatography data system for workstations. The optional control extensions for GC, PDA and GPC allow to use the software for a wide range of applications. Most KNAUER devices except the PLATINblue systems can be controlled with ClarityChrom. Additionally, devices and systems from more than 45 manufacturers are supported. The ClarityChrom Preparative includes the drivers for several fraction collectors and supports the peak recognition by level and/or slope. The manual fraction control and the option to use the KNAUER electrical valves for fractionation gives you flexibility.

► ChromGate CDS*

Chromatography data system

ChromGate is a full-featured Client/Server capable chromatography data system based on the EZChrom Elite core. It meets the demands of a powerful and robust software for data acquisition and analysis. Graphical methods, individual analysis reports, or calibration tables can be easily generated. Optional extensions such as PDA and GPC expand the operational field. ChromGate allows for full control of all KNAUER devices. It supports KNAUER's advanced fraction collector control option, which includes several functions for fraction recognition, stacked injection, fraction reporting and comes with drivers for several fraction collectors.



For more information



www.knauer.net/software

*) All packages available as a preparative Edition – an option exclusively offered by KNAUER



Technical support

Professionals for your equipment

What does excellent
service mean to you?



Technical support

Professionals for your equipment

All development and production steps are done at KNAUER in Berlin. Therefore our technical support team has very short ways to find answers to your questions and to solve technical problems.

Our experienced team can offer you a wide range of technical support like maintenance, qualification, and many other services.

Professional services

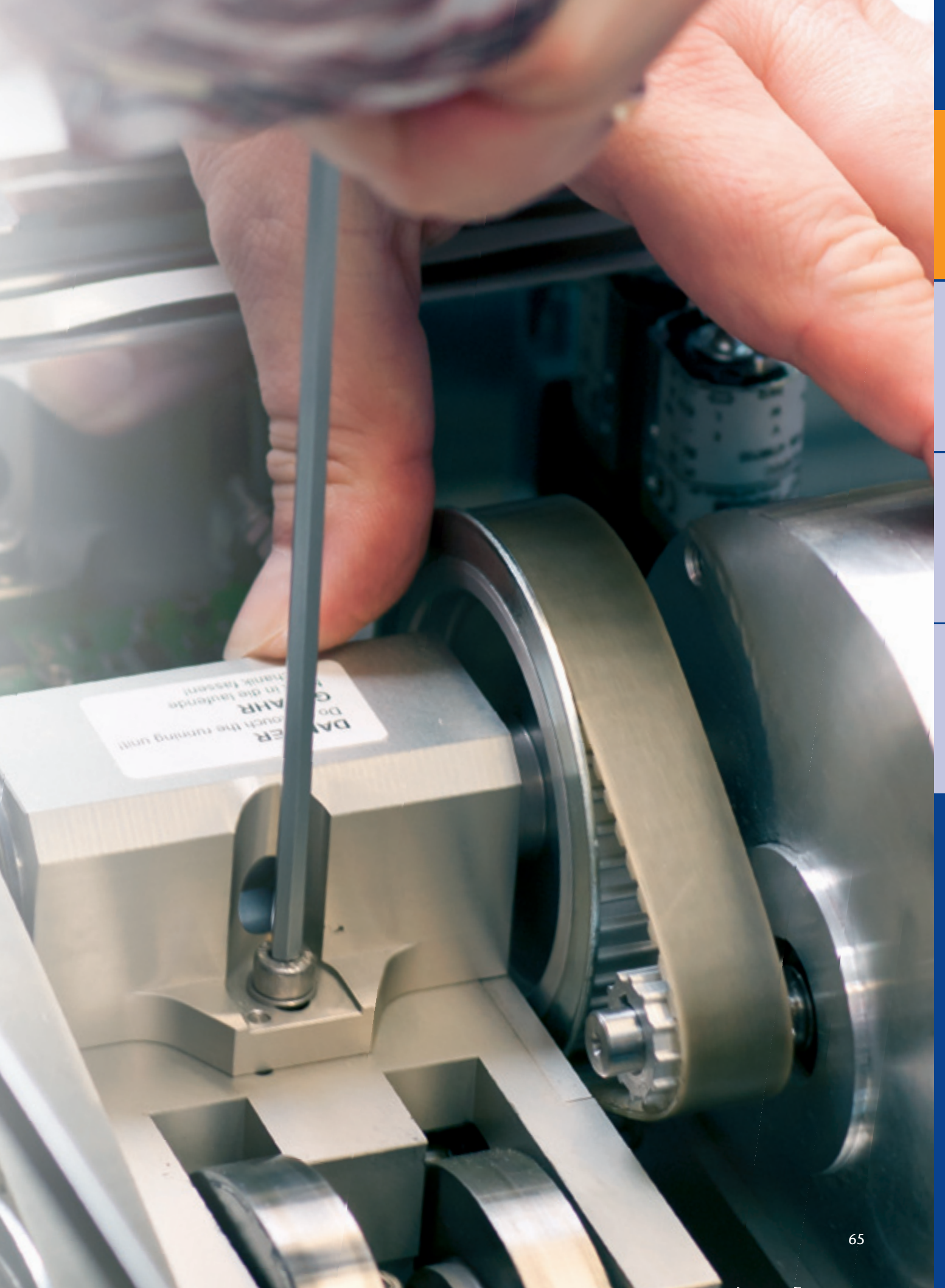
- ▶ Installation and operation qualification (IQ, OQ)
- ▶ Maintenance and repair
- ▶ Calibration
- ▶ Field service
- ▶ Technical service trainings
- ▶ Service contracts for preventive maintenance and training
- ▶ Technical support (troubleshooting)
- ▶ Providing bypass devices
- ▶ Device replacement
- ▶ Remote helpdesk
- ▶ Spare parts



For more information



www.knauer.net/techsupp



How can you get in touch with KNAUER?

KNAUER still believes in direct communication between people. When you pick up the phone and call the support number, you will talk to a real person – not to a computer. Besides a phone call, there are many other ways to get in touch with us.



Address

- ▶ Wissenschaftliche Gerätebau
Dr. Ing. Herbert Knauer GmbH
Hegauer Weg 38
14163 Berlin, Germany



Phone

- ▶ +49 30 809727-0



E-Mail

- ▶ Technical or service related questions: support@knauer.net
- ▶ General information: info@knauer.net



Internet

- ▶ www.knauer.net

Quick contact



www.knauer.net/contact





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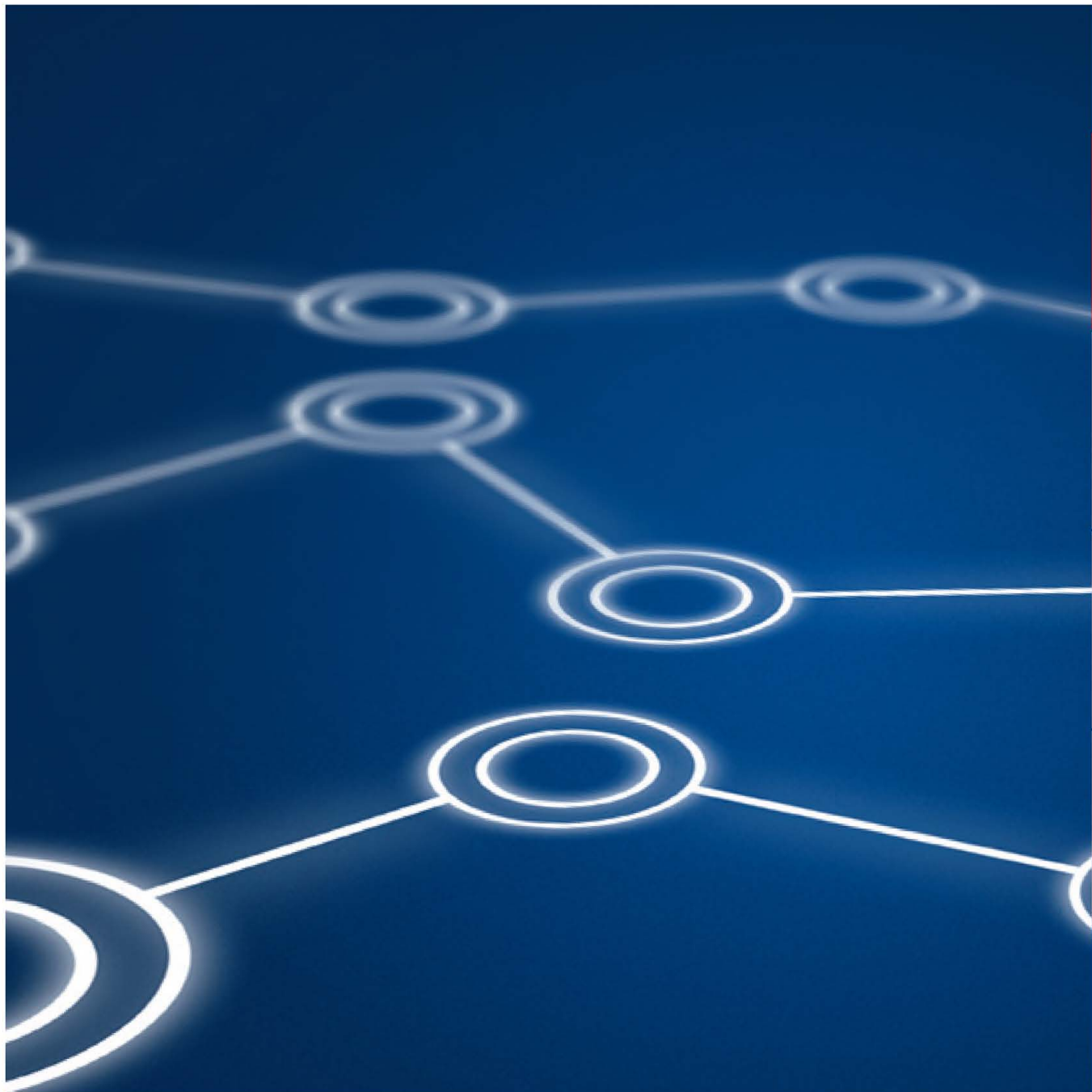
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AZURA
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BioFox
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Eurocel
Euroclean
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Chromeleon, Xcalibur (Thermo Scientific)
expression CMS (Advion Inc.)
Analyst (ABSciex)
Hystar (Bruker Corp.)
Clarity (DataApex)



Technical data are subject to change without notice.



HPLC • SMB • Osmometry

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