

# A guide to lab-scale protein purification with ÄKTA™ systems



# ÄKTA systems

ÄKTA™ lab-scale protein purification systems are designed for purification of biomolecules, providing speed and flexibility in research and process development. ÄKTA systems use intelligent UNICORN™ system control software to combine simplicity with power in protein purification from your lab bench to process development and full-scale bioprocess production. Scientists all over the world rely on ÄKTA systems, columns, and resins for their protein purification needs.



	ÄKTA start™	ÄKTA go™	ÄKTA pure™	ÄKTA™ avant
Applications	Transition from manual to automated protein purification/education in protein purification	Achieve desired purity with ease in routine purifications—make the most of valuable bench/cold-room space	Flexibility in research—match most current and future purification challenges	Productivity in process development—fast and secure development of purification processes
Automated and reproducible protein purification including support for gradient elution	•	•	•	•
Support for affinity chromatography, ion exchange chromatography, and multimodal (mixed mode) chromatography	•	•	•	•
Support for size exclusion chromatography	Limited capabilities	•	•	•
Support for hydrophobic interaction chromatography		Limited capabilities	•	•
Software compatible with regulatory requirements, e.g., GLP, GMP		•	•	•
Microscale purification			•	
Automated buffer preparation including pH scouting				•
Scale-up, process development			Optional	•
Method development and optimization using design of experiments (DoE)			Optional	•
Automated resin or column scouting			Optional	•
Automated multistep purification			Optional	Optional
Advanced automation including external equipment			Optional	Optional
Recommended flow rate (mL/min)	0.5–5.0	0.01–25.0	0.001–25/0.01–150	0.001–25/0.01–150
Max. operating pressure (MPa)	0.5	5	20/5	20/5

# ÄKTA start

## Affordable and easy-to-use protein purification

ÄKTA start, our simplest ÄKTA system, is an affordable, easy-to-use protein purification system that allows you to automate manual protein purification procedures in academic and educational labs. Save time, minimize labor, and learn how to use automated chromatography.

- Transition easily from manual to automated purification
- Get educated in protein purification techniques
- Gain deeper insights than with manual purification

## Transition easily to automated purification

We have thought about how to make your work easier at every step. From method creation and sample loading to expanding your system with fraction collection and data analysis. Make the change to ÄKTA start for convenient, automated purification that delivers reproducible results.

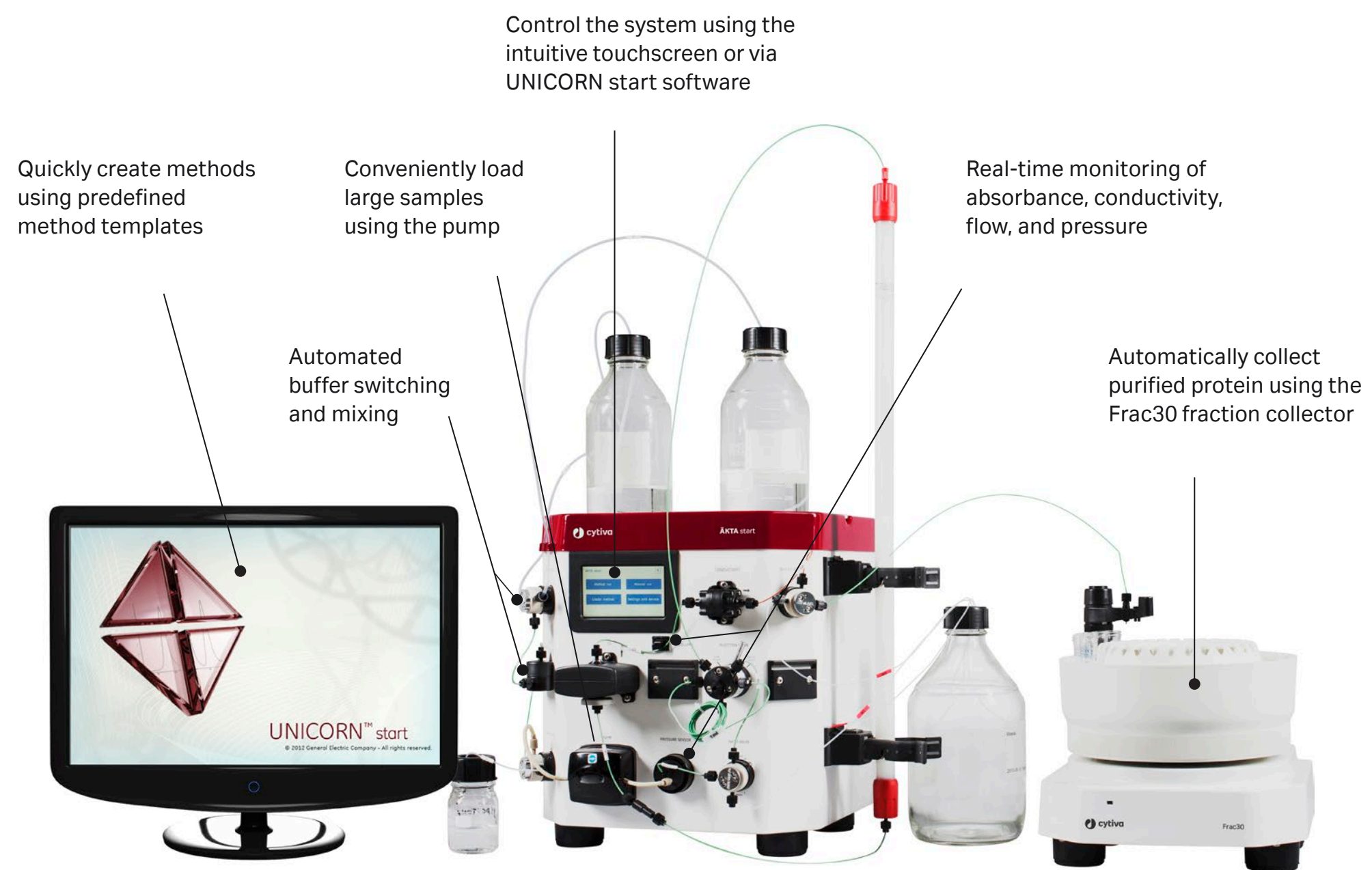
## Get educated in protein purification techniques

Utilize ÄKTA start to learn about purification of antibodies, tagged proteins, or untagged (native) proteins. Practical exercises using different chromatography techniques, column formats, and how to use UNICORN software provide an efficient way to train students.

## Gain deeper insights

UNICORN start software is intuitive and user-friendly, guiding you through each step in your purification—from creating a protocol and setting up your run to evaluating your results and custom creating a report. Gain valuable insights from real-time monitoring.





Compact and ergonomic system design. ÄKTA start fits neatly on your bench-top, and has a front-facing work area that allows easy access to the system. Run ÄKTA start using the intuitive touchscreen.



**Recommended columns**

- HiTrap™ columns
- HiPrep™ columns



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# ÄKTA go

## Achieve desired purity with ease in routine purifications

ÄKTA go is a compact system to support routine protein purification conducted in research laboratories. The system supports commonly used chromatography techniques in an easy and accessible manner.

- Make the most of valuable laboratory bench and cold cabinet space
- Intuitive method creation including columns and resins data
- Interactive **Process picture** for easy access of commands

## Make the most of valuable laboratory bench and cold-cabinet space

ÄKTA go is a compact system that includes all the needed functionality for commonly used chromatography techniques used in routine protein production. The small system footprint saves valuable space on your lab bench or in cold cabinets. The ability to place bottles on top and the fraction collector beneath the system also helps to save space.

## Intuitive method creation including columns and resin data

Methods for automated runs can be created in minutes using preprogrammed methods. Simply select the chromatography technique you would like to run and enter the requested run parameters. By selecting the column to be used, column data such as flow rate and pressure limits are prepopulated with default parameters to ensure the highest level of safety and integrity for the column, system, and chromatography run.

## Interactive **Process picture** for easy access of commands

The interactive **Process picture** helps you quickly start manual runs and enables manual interaction during automated runs. The **Process picture** will also allow for easy monitoring of the run, clearly displaying all relevant run data and system state. The **Process picture** gives you intuitive access to all essential information and necessary functionality.

## Parallel purification

Connect up to three ÄKTA go systems and control them through UNICORN software for efficient parallel purification. This compact setup supports automated one- and two-step workflows and enables simultaneous processing of up to 15 samples.





### Recommended columns

- HiTrap™ columns
- HiScreen™ columns
- HiPrep™ columns
- Tricorn™ columns
- HiLoad™ columns
- RESOURCE™ columns
- XK columns

[cytiva.com/AKTAgo](https://www.cytiva.com/AKTAgo)



# ÄKTA pure

## Easily customizable to meet current and future purification challenges

ÄKTA pure is a flexible purification system for proteins, peptides, and nucleic acids from microgram levels to tens of grams of target product in research applications. ÄKTA pure 25 is designed for a broad range of purification tasks in a multiuser environment, and ÄKTA pure 150 is well-suited for larger-scale (tens of grams) preparative purification.

- Tailor your protein purification system
- Flexible software to build automation methods to your needs
- Match most purification challenges

### Tailor your protein purification system

ÄKTA pure can be tailored to your precise needs through a broad selection of hardware options, from valves to monitors and fraction collectors. There is an ÄKTA pure for almost any imaginable purification task, like standard purification of tagged proteins, microscale purification, and unattended multistep purifications. Connecting and communication of external equipment, such as detectors or an autosampler, is enabled with the external equipment interface (I/O-box).

### Flexible software to build automation methods to your needs

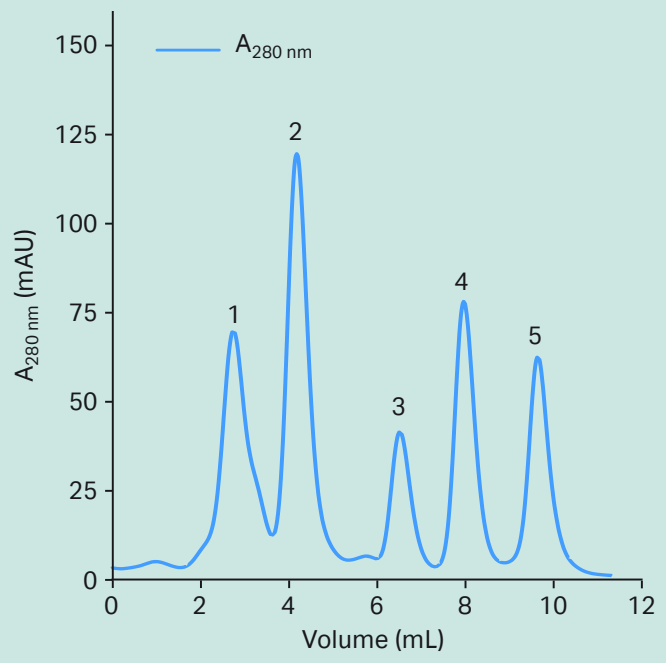
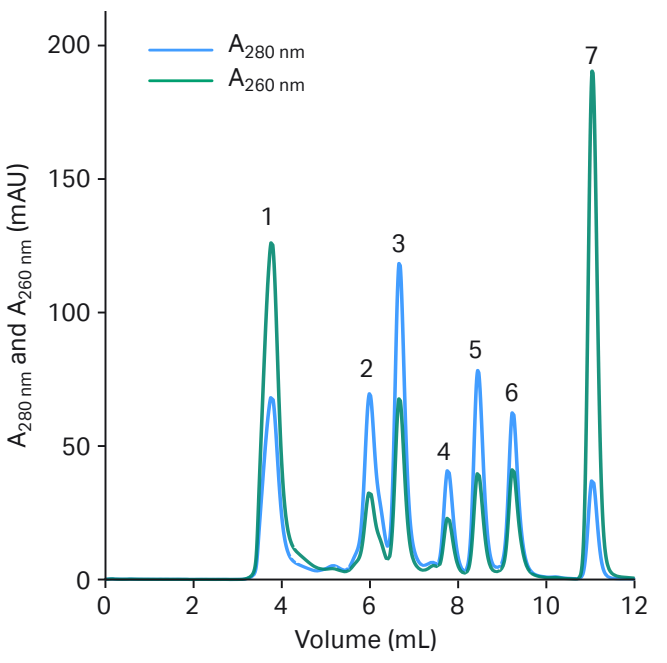
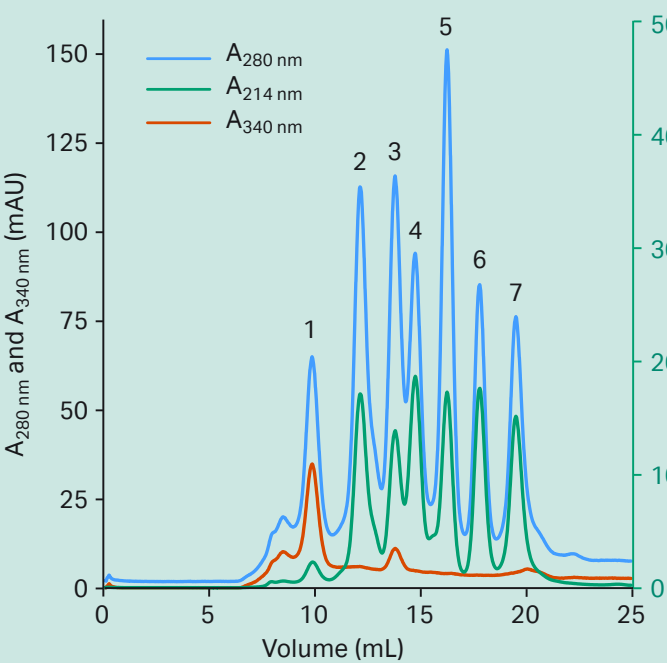
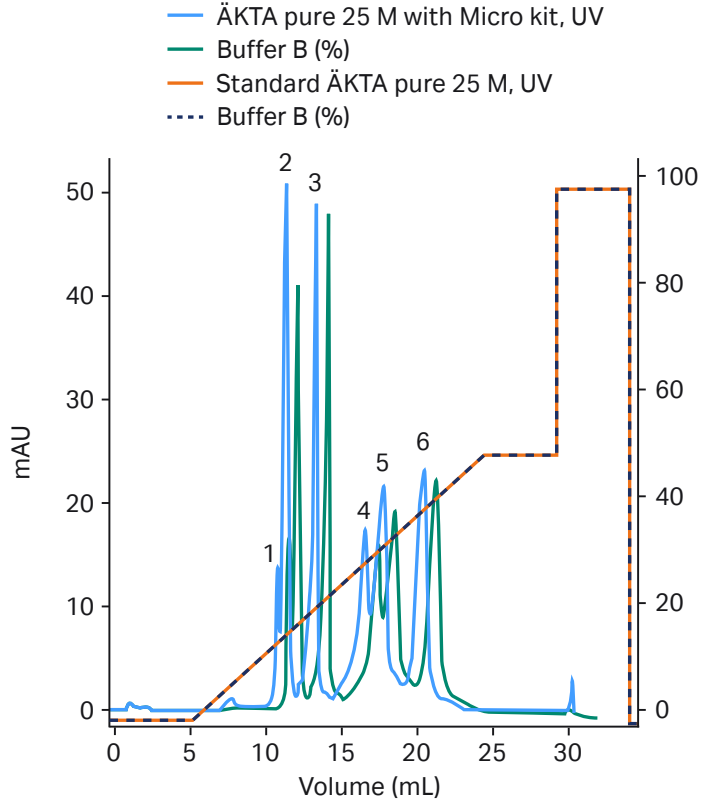
ÄKTA pure is used with UNICORN control software. The software includes built-in knowledge for planning, control, and evaluation of protein purification runs. Included in the software is the **Method editor** with predefined methods for all of our lab-scale chromatography columns. **Text editing** provides flexibility for advanced methods such as automated multistep purification for increased efficiency.

### Match most purification challenges

ÄKTA pure can be used for a wide range of techniques, such as affinity chromatography (AC), ion exchange chromatography (IEX), multimodal chromatography (MMC), hydrophobic interaction chromatography (HIC), and size exclusion chromatography (SEC). System hardware and software are designed to match applications utilizing the various techniques.

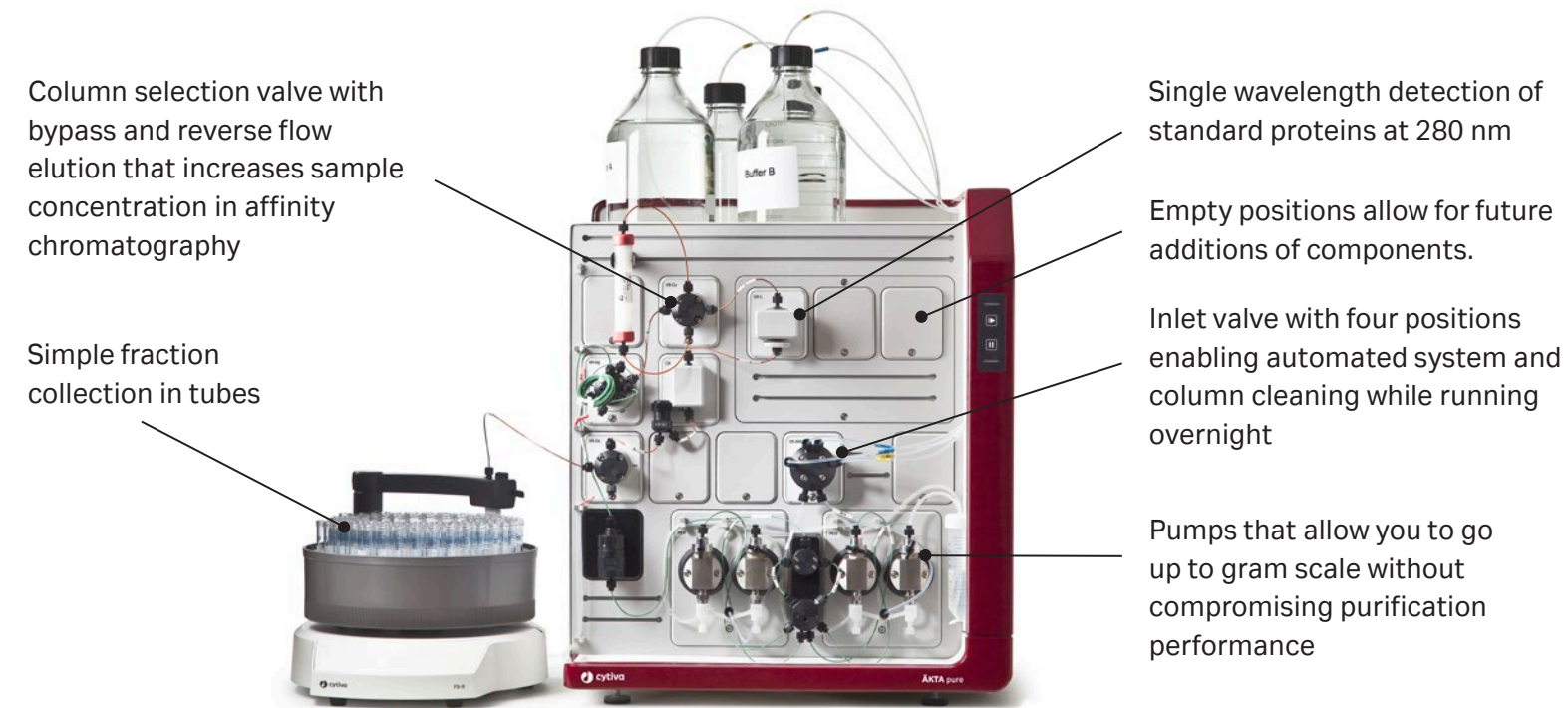


# ÄKTA pure is a flexible and intuitive chromatography system for fast purification of proteins, peptides and nucleic acids. Which is the best for your research?

	ÄKTA pure L	ÄKTA pure T	ÄKTA pure M	ÄKTA pure micro
Wavelength	Fixed at 280 nm	Dual 260/280 nm	Multi – choose up to 3 from 190 nm to 700 nm	Multi – choose up to 3 from 190 nm to 700 nm
Flow rate	ÄKTA pure L 25–25 mL/min ÄKTA pure L 150–150 mL/min	ÄKTA pure T 25–25 mL/min ÄKTA pure T–150 mL/min	ÄKTA pure M 25–25 mL/min ÄKTA pure M 150–150 mL/min	ÄKTA pure micro–25 mL/min
Pressure range (system pump)	ÄKTA pure L 25–0 to 20 MPa ÄKTA pure L 150–0 to 5 MPa	ÄKTA pure T 25–0 to 20 MPa ÄKTA pure T 150–0 to 5 MPa	ÄKTA pure M 25–0 to 20 MPa ÄKTA pure M 150–0 to 5 MPa	ÄKTA pure micro 25–0 to 20 MPa
Purification	Suitable for general protein purification, aromatic protein rings (tryptophan, tyrosine)	Suitable for purifying DNA “impurities” in protein samples, DNA, RNA or nucleic acid purification, phenylalanine rich proteins	Suitable for all proteins and purification of amino acids, peptides, small proteins without aromatics, proteins, nucleic acids, and RNA/DNA, etc	For improved resolution and sharper peaks and supporting Cryo-EM purifications
	<p>Column: Superdex 200 Increase 10/300 GL</p> <p>Sample: (1) Aldolase 3 mg/mL (<math>M_r</math> 158 000), (2) Conalbumin 3 mg/mL (<math>M_r</math> 75 000), (3) Carbonic anhydrase 0.9 mg/mL (<math>M_r</math> 29 000), (4) Ribonuclease 3 mg/mL (<math>M_r</math> 13 700), (5) Aprotinin 2.4 mg/mL (<math>M_r</math> 6500)</p> <p>Sample volume: 100 <math>\mu</math>L</p> <p>Eluent: PBS (10 mM sodium phosphate, 140 mM NaCl, 2.7 mM KCl, pH 7.4)</p> <p>Flow rate: 0.75 mL/min</p> 	<p>Column: Superdex 200 Increase 10/300 GL</p> <p>Sample: (1) Salmon Sperm DNA 0.3 mg/mL, (2) Aldolase 3 mg/mL (<math>M_r</math> 158 000), (3) Conalbumin 3 mg/mL (<math>M_r</math> 75 000), (4) Carbonic anhydrase 0.9 mg/mL (<math>M_r</math> 29 000), (5) Ribonuclease 3 mg/mL (<math>M_r</math> 13 700), (6) Aprotinin 2.4 mg/mL (<math>M_r</math> 6500), (7) Uracil 0.06 mg/mL (<math>M_r</math> 112 Da)</p> <p>Sample volume: 100 <math>\mu</math>L</p> <p>Eluent: PBS (10 mM sodium phosphate, 140 mM NaCl, 2.7 mM KCl, pH 7.4)</p> <p>Flow rate: 0.75 mL/min</p> 	<p>Column: Superdex 200 Increase 10/300 GL</p> <p>Sample: (1) Ferritin (s 440 000), (2) Aldolase (<math>M_r</math> 158 000), (3) Conalbumin 3 mg/mL (<math>M_r</math> 75 000), (4) Ovalbumin (<math>M_r</math> 44 000), (5) Carbonic anhydrase (<math>M_r</math> 29 000), (6) Ribonuclease (<math>M_r</math> 13 700), (7) Aprotinin (<math>M_r</math> 6500)</p> <p>Sample volume: 100 <math>\mu</math>L</p> <p>Eluent: PBS (10 mM sodium phosphate, 140 mM NaCl, 2.7 mM KCl, pH 7.4)</p> <p>Flow rate: 0.5 mL/min</p> 	<ol style="list-style-type: none"> <li>apo-Transferrin</li> <li>apo-Transferrin</li> <li><math>\alpha</math>-Lactalbumin</li> <li><math>\beta</math>-Lactoglobulin</li> <li><math>\beta</math>-Lactoglobulin</li> <li>myoglucosidase</li> </ol> 

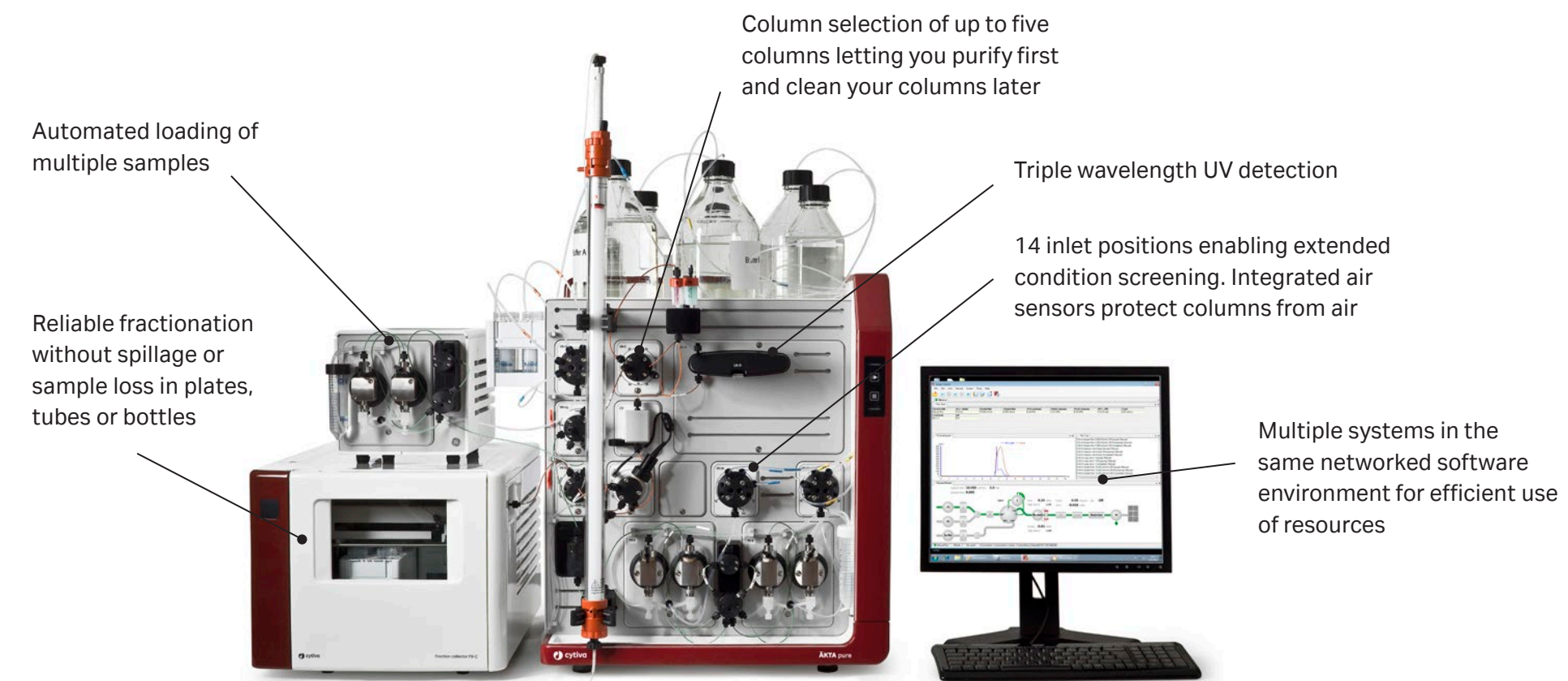
## Start simple and expand for future needs

When you would like to start with standard protein purification but still be assured that the system can grow with your future needs.



## Automated purification of antibodies and antibody fragments with ÄKTA pure

When you need to purify lots of different monoclonal antibodies for evaluation in discovery programs or other development projects.



**Recommended columns**

- HiTrap columns
- HiScreen columns
- HiTrap Fibro units
- HiScreen Fibro units
- HiPrep columns
- Tricorn columns
- HiLoad columns
- RESOURCE columns
- HiScale™ columns
- XK columns

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# ÄKTA avant

## Gain productivity in process development

ÄKTA avant is a purification system designed for fast and secure development of scalable methods. ÄKTA avant is available in two versions: ÄKTA avant 25, designed for screening; and ÄKTA avant 150, suitable for scaling up to larger columns.

- Screening and optimization
- Scale-up and scale-down studies
- Accelerated process development with DoE

## Screening and optimization

ÄKTA avant 25 is optimized for resin screening and method optimization using small HiTrap and HiScreen columns. The integrated **BufferPro** function includes ready-made buffer recipes to deliver buffers for scouting and preparation of buffer plates. Multiple sample and buffer inlets add automation possibilities for increased efficiency.

## Scale-up and scale-down studies

ÄKTA avant 150 is designed for scaling up to larger columns, such as HiScale and AxiChrom™ columns, as well as fine-tuning and robustness testing of the optimized process before moving on to pilot scale. Intelligent Packing of the AxiChrom columns, with 50 and 70 mm inner diameters, is supported via preprogrammed packing methods. ÄKTA avant can also be used for performing scale-down studies, such as viral clearance studies on HiScale 10/40 or Validation columns.

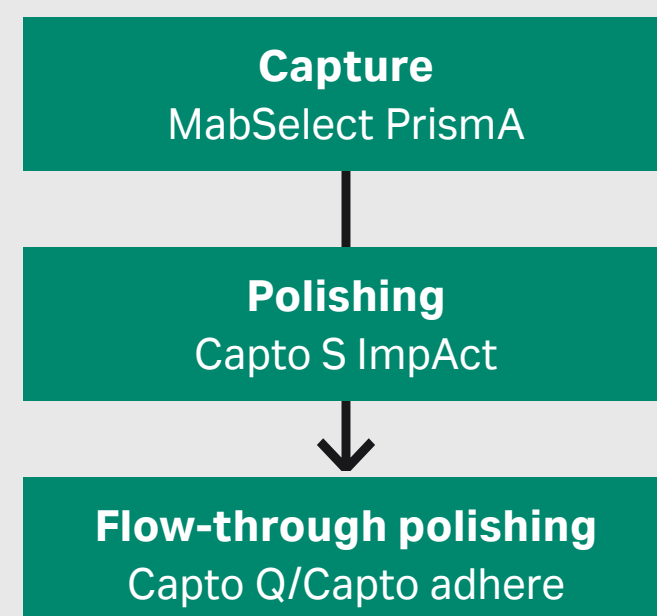
## Accelerated process development with DoE

Using the integrated design of experiment (DoE) functionality of UNICORN software, the number of experiments required to obtain sufficient process information can be greatly reduced. The software allows you to set up your experimental design and automatically generate chromatography scouting runs to save time.



## Use high-flow resins with ÄKTA avant for shorter runtimes

BioProcess™ chromatography resins are widely used by biopharmaceutical manufacturers. ÄKTA avant has the flow rate and pressure specifications that support high-flow chromatography resins such as MabSelect™ and Capto™ product ranges. These resins provide high dynamic binding capacity even at high flow rates. Using ÄKTA avant together with BioProcess resins can reduce runtimes, increase productivity, and allow easy scale-up.



Example of a three-step mAb purification process. To obtain sufficient results, the steps have different process requirements such as residence times. Short residence times require high flow rates supported by ÄKTA avant.

## Rapid cycling with Fibro chromatography

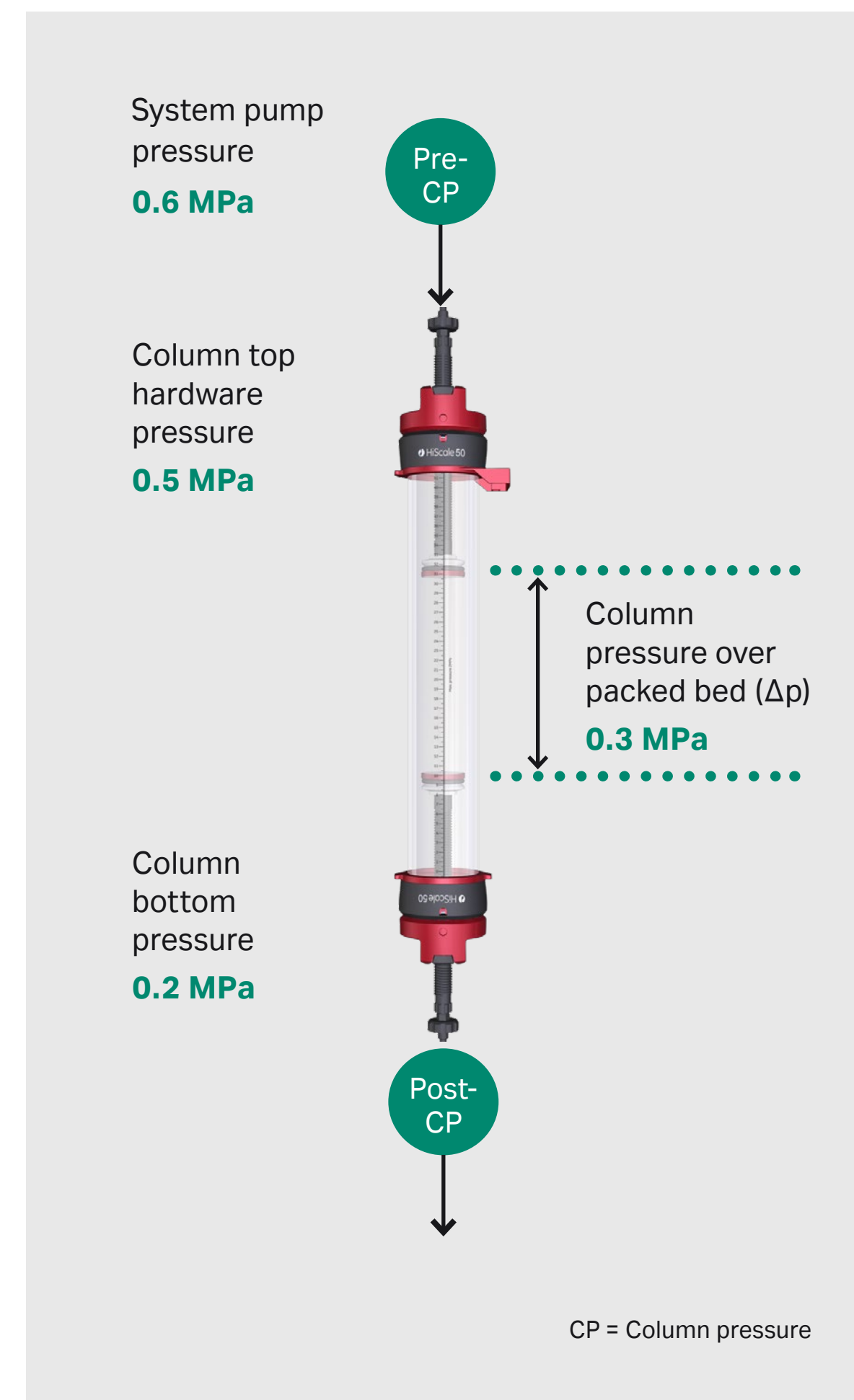
With purification cycles in minutes rather than hours, throughput can be increased up to 20-fold compared to resins.



Fibro chromatography is based on electrospun cellulose fibers, which enable the combination of high flow rates with high binding capacity. Residence time is measured in seconds, because binding properties do not depend on flow rate. This technology offers you new opportunities for flexible, high-productivity purification solutions from process development to manufacturing scale.

## ÄKTA avant provides high operational security

With built-in protection of the column and packed bed, runs can be securely performed at the maximum flow rate of the packed column. Keep track of column usage and performance with **Column logbook**. The built-in fraction collector keeps your fractions securely cooled when the system is used outside of working hours.



**Recommended columns**

- HiTrap columns
- HiScreen columns
- HiTrap Fibro units
- HiScreen Fibro units
- HiPrep columns
- Tricorn columns
- HiLoad columns
- RESOURCE columns
- HiScale columns
- AxiChrom columns

# Taking your process to the next scale

Once your process development is ready for the next step, it is time to transfer to pilot or manufacturing scale. To fully utilize the work done in process development, it is important to use scalable products; we provide products for each scale and step of the process.



PreDictor™ platform



HiTrap and HiScreen columns



Validation columns



ÄKTA avant system



ÄKTA pilot 600 system



ÄKTA ready system



ÄKTA process™ CFG chromatography system



ReadyToProcess™ columns



AxiChrom columns



Screening

Method optimization

Scale-up and robustness testing

Transfer to production scale

# UNICORN

## Software for fast and efficient protein purification

UNICORN software has supported protein purification for 25+ yr and provides extensive application knowledge. UNICORN is used with ÄKTA systems to plan and control runs, as well as analyze results. The UNICORN platform is fully scalable and is suitable for use in research and all the way to manufacturing.

- Gives you interactive control
- Keep track of column performance
- Evaluate your results simply and quickly

### Interactive control

UNICORN software gives you real-time control of protein purification systems. Every step is easy and methods are generated quickly using predefined methods, drag-and-drop function with predefined phases, or text editing for full programming control in the intuitive **Method editor**. The interactive **Process picture** shows the state of the chromatography run and the active flow path. It also provides full access to parameter settings for manual control of your run.

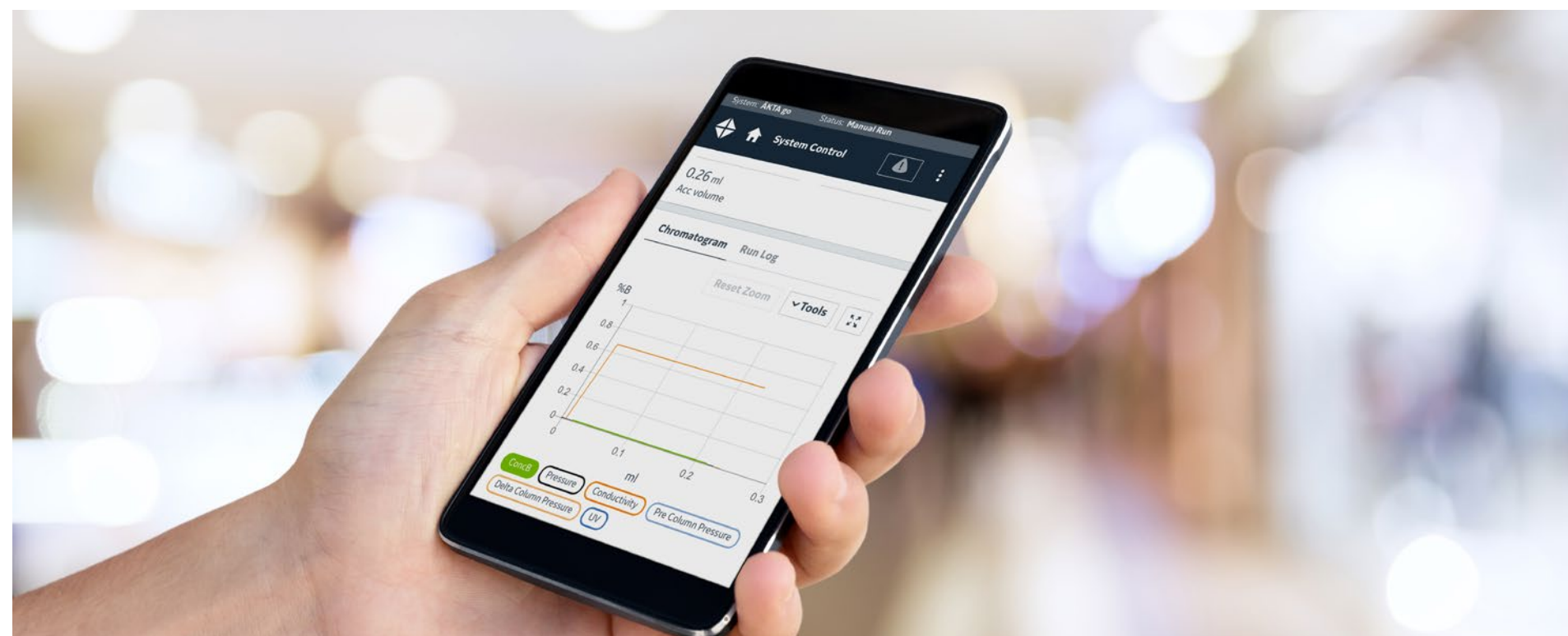
### Keep track of column performance

**Column logbook** keeps track of column performance and important run data, providing traceability and increased operational security. Columns can be identified using a barcode scanner.

### Simplicity for quick evaluation

UNICORN provides complete functionality, with the **Evaluation module** providing a simplified user interface optimized for most commonly used workflows. Key functionality is accessed with single-click operation and ribbon interface. Your preferred way of visualizing results can be selected using the tile overlay view and sort by scouting variables.





### Networking capability

With UNICORN software installed in a network configuration, methods can be developed, runs monitored, and results evaluated from your office computer.

Over the network, developed methods and results are easily shared among users and between instruments.

### My Instruments

My Instruments offers a real-time overview of your entire fleet of systems. At a glance, you can view the status of your systems and any alarms that need your attention. Just click to see additional system information like logged-in users and running method status. You can also open the system in UNICORN online to control and monitor a run. You can access My Instruments in a web browser without installing any applications.

### UNICORN online

UNICORN online is an add-on to UNICORN control software that provides intuitive, remote control and monitoring from mobile devices and computers. Contact your sales representative for more information and installation.

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# UNICORN start

UNICORN start is the control software designed for ÄKTA start. UNICORN start allows you to design runs, operate the ÄKTA start instrument, and evaluate and share results. While ÄKTA start can function as a stand-alone system UNICORN start software maximizes the performance of the instrument.

Monitor your run using the interactive **Process picture** map. This valuable functionality gives you real-time information about the current step, chromatogram, and various curves. Methods can be created using predefined templates or created by dragging and dropping chromatography phases from the **Phase library**.

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# Prepacked columns and resins for protein purification in research scale

We offer products for high quality, reproducible purification of most proteins and biomolecules. If you need a helping hand to select resins and prepacked columns or if you want to build your own ÄKTA chromatography system, try the Purify app.

[cytiva.com/purify-app](https://www.cytiva.com/purify-app) →

## Affinity chromatography

Affinity chromatography (AC) separates proteins on the basis of a reversible interaction between the target protein (or group of proteins) and a specific ligand attached to a chromatography matrix. AC separates molecules on the basis of biorecognition, including different tagged recombinant proteins such as Histidine, Glutathione S-Transferase (GST), Strep-tag® II and Maltose-binding protein (MBP), as well as different resins for antibody purification. AC offers high selectivity and intermediate to high capacity. Elution can often be performed under mild conditions.

## Size exclusion chromatography

Size exclusion chromatography (SEC, or gel filtration) allows separation of substances with differences in molecular size, under mild conditions. SEC can be used for protein purification (fractionation) or for group separation in which the sample is separated in two major groups.

## Ion exchange chromatography

Ion exchange chromatography separates proteins with differences in surface net charge to give high-resolution separation with high sample loading capacity. The separation is based on the reversible interaction between a charged protein and an oppositely charged chromatography resin.

## Multimodal (mixed mode) chromatography

Multimodal ion exchangers, for example, Capto adhere and Capto MMC, have been developed to offer novel selectivities. The charged ligands are complemented with extra functional groups that introduce additional cooperative interactions (combinations of hydrogen bond, hydrophobic, and van der Waals' interactions).

## Hydrophobic interaction chromatography

Hydrophobic interaction chromatography separates proteins with differences in hydrophobicity. Separation is based on the reversible interaction between a protein and the hydrophobic surface of a chromatography resin.



# Upgrade your ÄKTA system today

ÄKTA systems have offered versatile and reliable protein purification since the 1990s. As a consequence of the renewal of the ÄKTA system platform, production of ÄKTAexplorer, ÄKTApurifier, ÄKTAFPLC, ÄKTAprime plus, ÄKTAxpress and ÄKTAmicro has been discontinued. To improve your protein purification output, we recommend upgrading to ÄKTA avant, ÄKTA pure, and ÄKTA go.

Discontinued system		Upgrade to	Product code
ÄKTAexplorer 10	→	ÄKTA avant 25	28930842
ÄKTAexplorer 10S			
ÄKTAexplorer 100	→	ÄKTA avant 150	28976337
ÄKTAexplorer 100 Air			
ÄKTAFPLC	→	ÄKTA go	29383015
ÄKTApurifier UPC 10		ÄKTA pure 25 L	29018224
ÄKTApurifier 10	→	ÄKTA pure 25 M	29018226
ÄKTApurifier 10 plus			
ÄKTApurifier UPC 100	→	ÄKTA pure 150 L	29046665
ÄKTApurifier 100	→	ÄKTA pure 150 M	29046694
ÄKTApurifier 100 plus			
ÄKTAprime plus	→	ÄKTA go	29383015
		ÄKTA pure 25 L	29018224
ÄKTAxpress	→	ÄKTA pure 25 Configured for automated multistep purification	*
ÄKTAmicro	→	ÄKTA pure micro system	29301909

\* Contact your local sales representative for further information.

Visit Purify app, our system configurator and column selection guide, to experience for yourself the ÄKTA family of chromatography systems, columns and resins:



Or visit [purify-app.cytivalifesciences.com](https://purify-app.cytivalifesciences.com)



Would you like to keep updated with the latest tools and trends, hints, tips and troubleshooting for ÄKTA chromatography systems and consumables?

Sign up for Purify club



Get started with free online course



Request your resin selection guide for free



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