

Pure proteins today.  
Powerful results  
tomorrow.

ÄKTA™ protein purification systems



# ÄKTA

**Pure proteins today.  
Powerful results tomorrow.**

ÄKTA lab-scale protein purification systems are designed for purification of biomolecules, providing speed, performance, 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 today to process development and full-scale bioprocess production tomorrow.

With ÄKTA systems, backed by GE Healthcare columns and chromatography media (resins), you are taken reliably from lab bench to pilot and production scale.

That is why over 100 000 scientists all over the world rely on ÄKTA systems for their protein purification needs.

Whatever your application and purification scale needs, we can help you change tomorrow today.

## Flexibility in research

Proteins are as different as you and me. When you need to purify them, one protocol does not fit all proteins. In research you need to get the very best out of each sample. With such diversity, sometimes it might feel as if you are battling on several fronts. Relax, within the range of ÄKTA lab-scale systems there are alternatives focusing on flexibility, ease of use, and reliability to address whatever your research requires.

## Productivity in process development

In today's environment, you need to make sure the competitive advantage is on your side of the bench. Today's challenges within biopharmaceutical process development include increasing cost pressures while overcoming even tougher regulatory requirements and demands for speed to market. These pressures do not diminish the fact that your primary goal is to achieve swift and secure handover of robust processes. ÄKTA avant is the icon of process development and optimized for chromatography media screening and method optimization using small columns as well as scaling up to larger columns for fine-tuning and robustness testing of the optimized process.



Way of working	ÄKTA start	ÄKTAprime plus	ÄKTAexpress	ÄKTA pure	ÄKTA avant
Simple, one-step desalting, buffer exchange	●	●	●	●	●
Automated and reproducible protein purification using all common techniques including support for gradient elution	●	●	●	●	●
Software compatible with regulatory requirements, e.g., GLP			●	●	●
Method development and optimization using design of experiments (DoE)				○	●
Automatic buffer preparation including pH scouting					●
Automatic medium or column scouting				○	●
Automatic multi-step purification		○	●	○	○
Scale-up, process development				○	●
Flow rate (ml/min)	0.5-5	0.1-50	0.1-65	0.001-25/0.01-150	0.001-25/0.01-150
Max. operating pressure(MPa)	0.5	1	3	20/5	20/5
Software <sup>1</sup> for system control and data handling	UNICORN start	PrimeView™ <sup>2</sup>	UNICORN 5	UNICORN 6 or later	UNICORN 6 or later

<sup>1</sup> A specific software version might be needed for the chosen system.

<sup>2</sup> With PrimeView, you can monitor results and evaluate data but not create methods nor control the system.

GLP = good laboratory practice    1 MPa = 10 bar, 145 psi    ● = included    ○ = optional

# 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 automatic purification
- ✓ Gain deeper insights
- ✓ Simplify your work



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## Transition easily to automatic purification

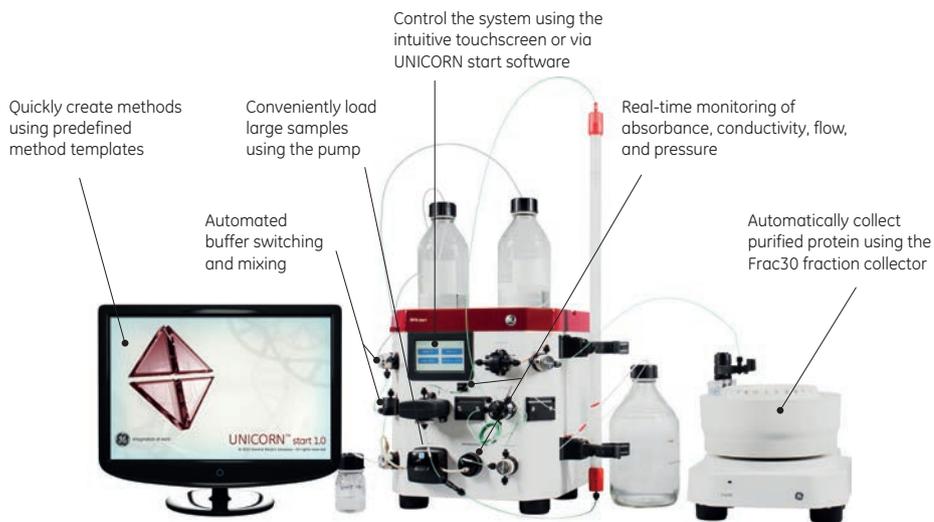
We have thought about how to make your work easier at every step. From method creation and sample loading to expanding your system with fraction collection and data analysis. Make the change to ÄKTA start for convenient automatic purification that delivers reproducible results.

## 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.

## Simplify your work

Our application-specific column packages contain ready-to-use columns adapted to your purification task. Whether you are purifying antibodies, tagged proteins, or untagged (native) proteins, our prepacked column packages give you quick start-up times and reproducible results with minimal effort.



**i** **Recommended columns**

- HiTrap™ columns
- HiPrep™ columns

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.

# ÄKTAprime plus

## A workhorse for simple protein purification

ÄKTAprime plus is a cost-effective protein purification system for industry and research labs. ÄKTAprime plus features push-button control and incorporates all the components you need for fast and simple protein purification. There are preprogrammed methods for most common applications.

- ✓ Minimize tedious, repetitive work
- ✓ Get started quickly with preprogrammed methods
- ✓ Keep track of your run



## Minimize tedious, repetitive work

The ÄKTAprime plus system automates liquid handling, minimizing the problem of sample loss through spillage or misplaced tubes. Access to data on recovered target proteins is more straightforward than manual procedures allow.

## Preprogrammed methods

With optimized preprogrammed methods and prepacked columns, you can rely on consistent performance and more easily obtain the purity and yields that you desire.

## Keep track of your run

ÄKTAprime plus includes a pH monitor, as well as PrimeView software enabling the protein to be automatically and continually tracked in real time. PrimeView software shows you exactly what is happening throughout the run. Result files contain a complete record of each run, including method, curve data, and run log.



### Recommended columns

- HiTrap columns
- HiPrep columns
- HiLoad™ columns



# ÄKTExpress

## Automated affinity purification of multiple protein samples

ÄKTExpress is a robust and compact system for automated multi-step or parallel processing of biomolecules such as tagged proteins and antibodies. Purpose-designed hardware, UNICORN 5 software and prepacked media enable high purity and ensure increased output.

- ✓ Your purification expert with built-in intelligence
- ✓ Minimize hands-on time through automation
- ✓ Increase your output



## Built-in intelligence

ÄKTExpress gives you high purity for structural and functional studies. Pre-optimized generic protocols with a choice of up to four purification steps minimize the need for chromatography expertise. Protocols supporting purification of dual-tagged proteins and affinity tag cleavage are also available.

## Automated use

For antibodies, ÄKTExpress delivers highly pure material for preclinical screening. Single-step or two-step purification of up to four antibodies per run can be done automatically. Automated washing procedures enable processing of multiple samples and minimize risk of cross-contamination.

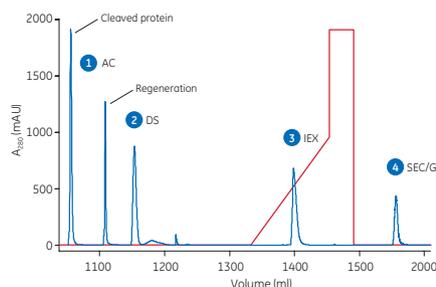
## Increase your output

The system design can be expanded to match increasing workloads in the lab. Up to four different samples can be purified using a single system module, and up to 48 samples using a 12-module system.

ÄKTExpress for tagged protein purification can handle protocols with up to four purification steps on a single instrument: affinity (AC), desalting (DS), ion exchange (IEX), and size exclusion chromatography (SEC)/ Gel Filtration (GF), and optional tag removal

Example of four-step purification with tag removal included:

AC: HisTrap™ HP 5 ml  
DS: HiPrep 26/10 Desalting  
IEX: RESOURCE™ Q 6 ml  
Protease: ACTEV



## Recommended columns

- HiTrap columns
- HiPrep columns
- Tricorn™ columns
- HiLoad columns

# ÄKTA pure

## Easily customizable to meet your purification challenges

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

- ✓ Tailor your protein purification system
- ✓ Intuitive software lets you focus on your research
- ✓ Match most purification challenges



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### Tailor your protein purification system

ÄKTA pure can be tailored to your precise needs through a broad selection of hardware options, from valves and tubing to monitors and fraction collectors. There is an ÄKTA pure for almost any imaginable purification task, from standard protein purification of tagged proteins to automated purification of samples, and unattended multi-step purifications.

### Intuitive software lets you focus on your research

ÄKTA pure is equipped with a simple and intuitive control software, specifically designed to save time and provide total control of your protein purification. The software includes built-in knowledge for planning, control, and evaluation of protein purification methods. Included in the control software is the **Method Editor** with predefined methods for all of our lab-scale chromatography columns.

### Match most purification challenges

ÄKTA pure can be configured 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.

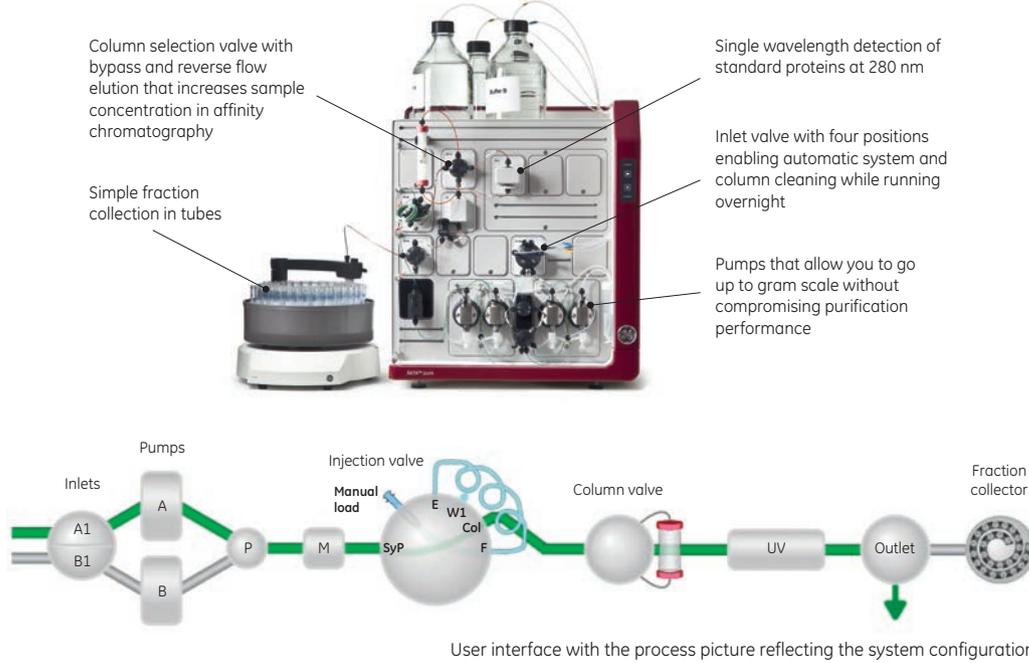


#### **Recommended columns**

- HiTrap columns
- HiPrep columns
- Tricorn columns
- Size-exclusion columns
- HiLoad columns

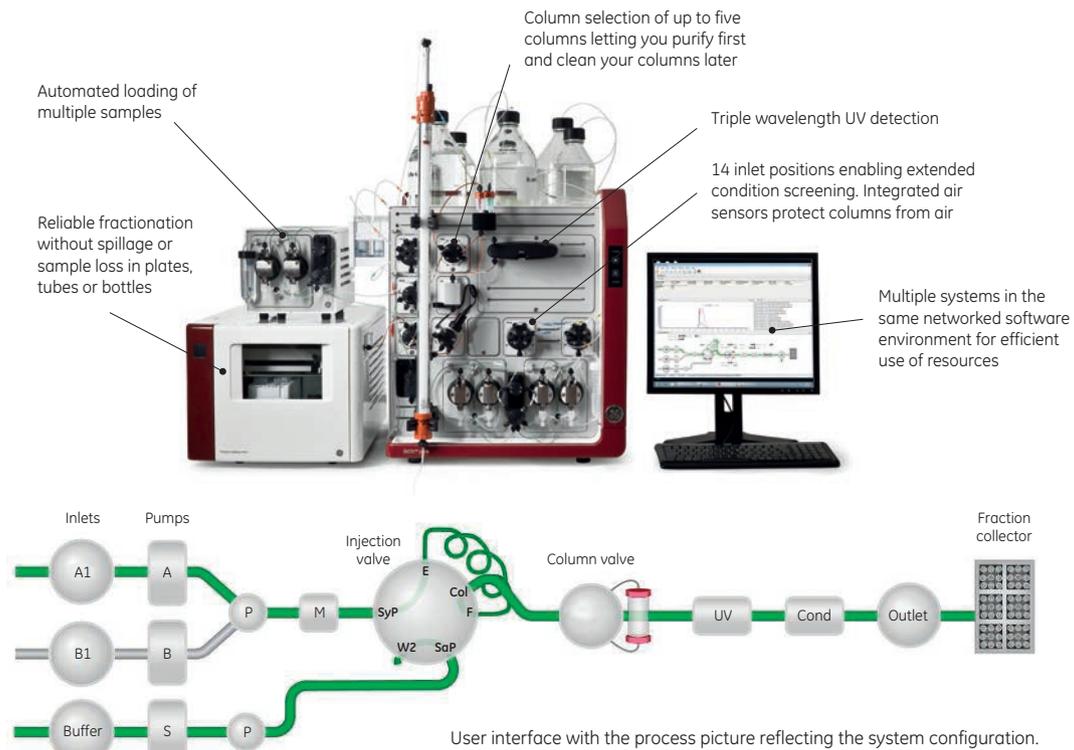
## Standard protein purification with ÄKTA pure

When you want to focus on your research without spending all your time on protein purification.



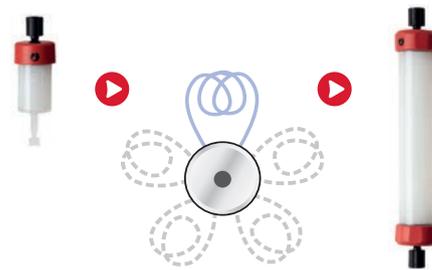
## Automated purification of antibodies and antibody fragments with ÄKTA pure

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

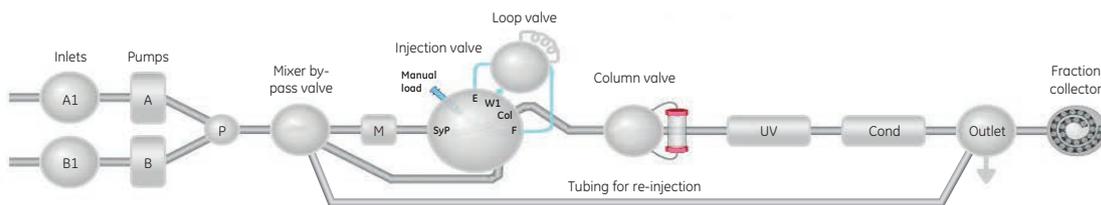


## Multi-step purification for fast and efficient protein purification

Purification of protein to sufficiently high yield and purity can be a time- and resource-consuming process. To address fast and efficient protein purification, ÄKTA pure can be set up in different ways to handle multi-step purification. For example, the loop valve can be used when performing multiple consecutive protein purification steps to free up hands-on time. The loop valve allows up to five different eluted peaks to be collected and re-injected on the next column.



Five different eluted peaks from one step can be collected in the loop valve and re-injected.



User interface with the process picture reflecting the system configuration.

## Incorporate external equipment into your ÄKTA pure

ÄKTA pure, with a fully modular design, can be further expanded to increase flexibility and system capability. The modules are designed for easy access and quick replacement, allowing fast and efficient customization. The versatile valve is a general four-position valve that can be used to tailor the system to specific tasks, for example, for multi-step purification. Connecting and communication of external equipment, such as detectors or an autosampler, is enabled with the external equipment interface (I/O-box).



# ÄKTA avant

## Gain productivity with fast and secure development of purification processes

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

- ✓ Increase efficiency in your method development
- ✓ Reduce your runtimes
- ✓ Minimize failures and maximize instrument use



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### Increase efficiency in your method development

Methods are quickly and easily created in UNICORN software using predefined methods for a wide range of different chromatographic techniques. With automatic scouting to find optimal buffer compositions, and the integrated **DoE** tool, time can be saved and process knowledge significantly increased.

### Reduce your runtimes

Short runtimes are an important component of efficient manufacturing. ÄKTA avant can help reduce your runtimes by supporting high flow rates, and is well suited for use with high-flow chromatography media such as Capto™ and MabSelect™ product ranges. With built-in protection of the column and packed bed, runs can securely be performed at the maximum flow rate of the packed column.

### Minimize failures and maximize instrument use

With ÄKTA avant, the UNICORN function **Column Logbook** keeps track of individual columns used in your lab and provides column history and performance trending data. To enable instrument use outside working hours, the built-in fraction collector keeps your fractions securely cooled until you are ready for the next step. Installed in a network configuration, methods can be developed, runs monitored, and results evaluated from your office computer and easily shared among users.



### Recommended columns

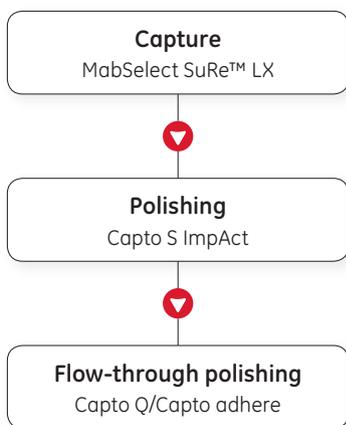
- HiTrap columns
- HiScreen™ columns
- HiPrep columns
- Tricorn columns
- HiLoad columns
- HiScale™ columns
- AxiChrom™ columns



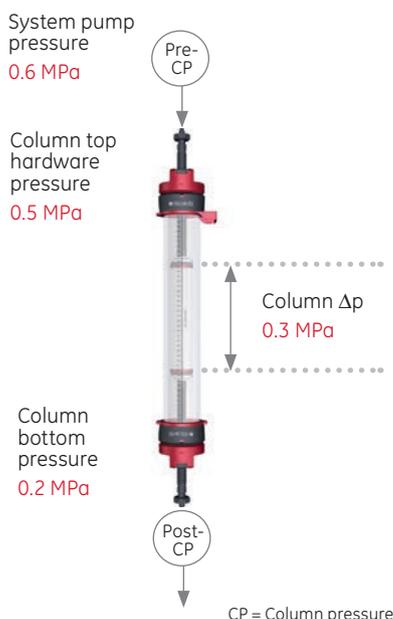
## Use high-flow media for shorter runtimes

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

For process times to be as short as possible, the chromatography run is often performed at the maximum flow rate of the packed column. To enable unattended operation under such conditions, pressure sensors before and after the column help maintain column pressure below its limit to protect the column and packed bed from overpressure.



Example of a three step monoclonal antibody 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.



## Quickly prepare your buffers in-line

Your choice of buffer is conveniently mixed in-line using **BufferPro**. The tool minimizes your effort by accurately delivering buffers of desired composition for a large number of applications, such as automatic scouting for a large number of pH and conductivity conditions to find optimal buffer compositions.

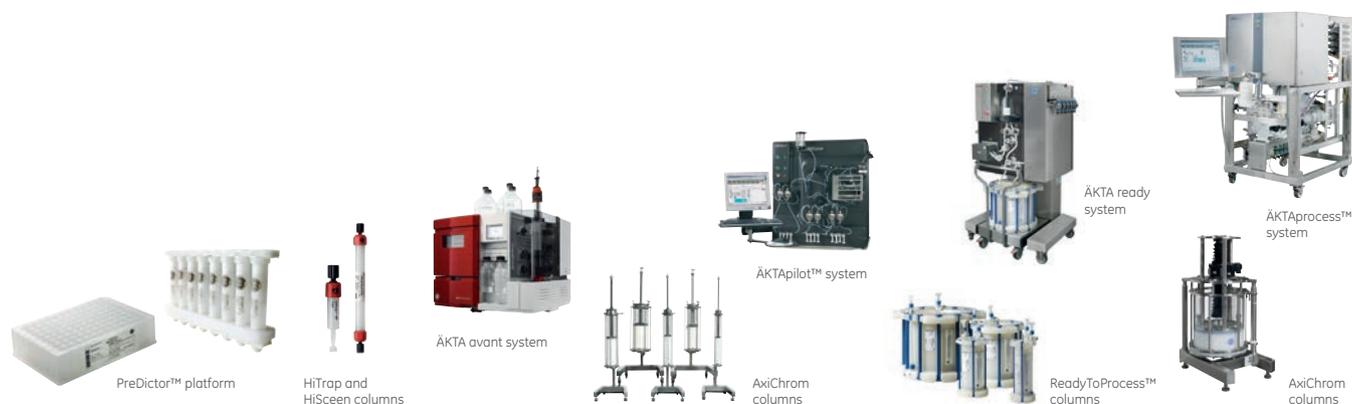
## Keep your fractions cooled until ready for the next step

The built-in fraction collector enables automatic detection of deep well plates, tubes, or bottles and keeps the fractions securely cooled until ready for the next step.



# 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.



Screening



Method optimization



Scale up and robustness testing



Transfer to production scale

**UNICORN** software makes it simple to control every stage and scale of your purification process.

**ÄKTA pilot** system is for process development, process scale-up, scale-down, and small-scale production.

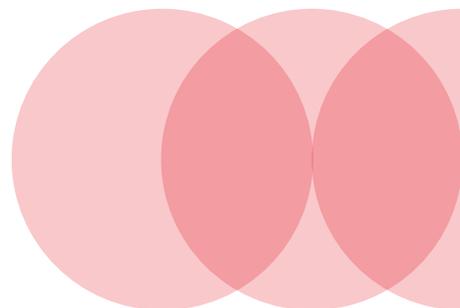
**ÄKTA ready** system is for process scale-up and biopharmaceutical production. The system uses disposable flow paths that reduces cleaning validation efforts and risk for cross-contamination, which is particularly useful in multiproduct facilities.

**ÄKTA process** system is for production-scale purification and offers the benefits of customization combined with other advantages such as short delivery time, comprehensive documentation, and off-the-shelf spare parts.

**AxiChrom** column platform is a revolutionary concept in column chromatography that simplifies column handling at all scales, from process development in ÄKTA avant to full-scale production. AxiChrom columns give you greater consistency through intelligent packing and make scale-up more predictable compared with other columns.

**ReadyToProcess** columns are validated high-performance bioprocessing columns, supplied prepacked and ready for use. The columns are available with a range of BioProcess media in four different sizes. Standardized column formats allow off-the-shelf availability for short delivery lead times.

The **BioProcess** media family includes chromatography media widely used by biopharmaceutical manufacturers for high binding capacity, fast mass transfer, chemical resistance, great selectivity, and security of supply. Our range of chromatography media covers several different types of liquid chromatography at all scales of purification, from research- to process-scale. Using BioProcess media early in process development can reduce process time, increase productivity, and allow easy scale-up.

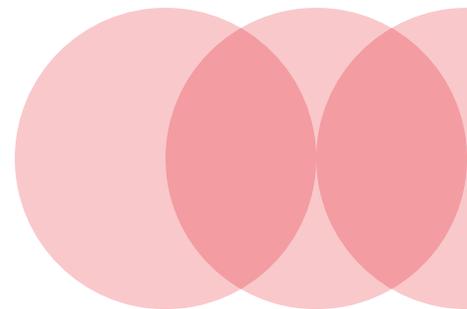


# UNICORN

## Software for fast and efficient protein purification

UNICORN software includes over 20 years of experience in protein purification and provides extensive application knowledge built into the software. UNICORN<sup>1</sup> is used with ÄKTA avant and ÄKTA pure to plan and control runs, as well as analyze results. Fully scalable, the UNICORN platform is suitable for use within research all the way to manufacturing.

- ✓ Gives you interactive control
- ✓ Simplicity for quick evaluation of your results
- ✓ Saves you time with integrated **DoE** tool



### 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.

The UNICORN function **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.

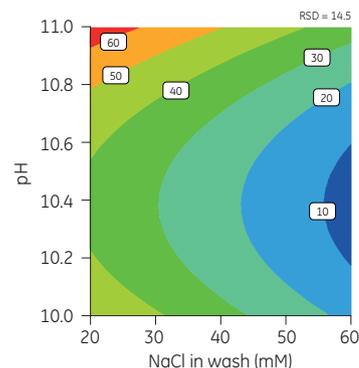
<sup>1</sup>UNICORN 6 and later versions

### Simplicity for quick evaluation

UNICORN 7 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 tile overlay view and sort by scouting variables. Once advanced operations, like DoE, are performed, simply switch to **Evaluation classic** (available in UNICORN 6 and 7) for full evaluation capabilities.

### Save time with integrated DoE

Optimize your methods efficiently using the **DoE** tool. This feature allows you to plan and automatically run an experimental series that maximizes the amount of information obtained from a minimum number of experiments.



Response surface plot for DoE evaluation, with colors indicating how different factors (pH, conductivity) influence a given outcome (protein binding to chromatography column, white squares).



### DoE handbook

The DoE handbook will guide you in performing DoE, using UNICORN software as an example, for setting up an efficient experimental plan so you can gain confidence in your results.

### 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.

## 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.

UNICORN start software has an intuitive graphic user interface that enables users to perform operations like controlling flow path, peak integration, and report generation in a single-click.

# Columns and media for protein purification in research scale

We offer products for high quality, reproducible purification of most proteins and biomolecules.



## 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 media for antibody purification. AC offers high selectivity, hence high resolution, and intermediate to high capacity. Elution can often be performed under mild conditions.

For further information see Affinity Chromatography Handbook: Principles and Methods (18102229).

## 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.

For further information see Size Exclusion Chromatography Handbook: Principles and Methods (18102218).

## Ion exchange chromatography

Ion exchange chromatography separates proteins with differences in surface 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 medium.

For further information see Ion Exchange Chromatography and Chromatofocusing Handbook: Principles and Methods (11000421).

## Multimodal chromatography

Multimodal ion exchangers, for example, Capto adhere and Capto MMC media, 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).

For further information see Multimodal Chromatography Handbook (29054808).

## Hydrophobic interaction chromatography

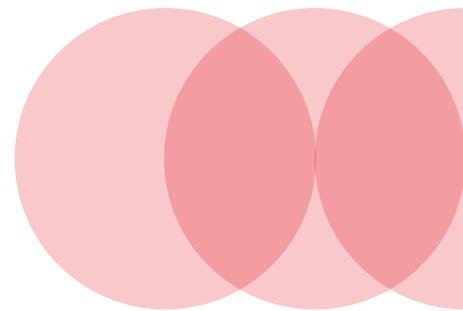
Hydrophobic interaction chromatography separates proteins with differences in hydrophobicity. Separation is based on the reversible interaction between a protein and the hydrophobic surface of a chromatography medium.

For further information see Hydrophobic Interaction Chromatography and Reversed Phase Handbook: Principles and Methods (11001269).

Guidance for prepacked columns and chromatography media for the different techniques recommended for different ÄKTA systems can be found in the Purify app as well as in the Selection guide: Prepacked chromatography columns for ÄKTA systems (28931778).



# Upgrade your protein purification system



Since the 1990s ÄKTA systems have offered versatile and reliable protein purification. As a consequence of the renewal of the ÄKTA system platform, production of ÄKTAexplorer, ÄKTApurifier, ÄKTAFFPLC and ÄKTAmicro has been discontinued. To improve your protein purification output we recommend upgrading to ÄKTA avant and ÄKTA pure, as outlined in the table below.

Discontinued system		Upgrade to	Product code
ÄKTAexplorer 10	▶	ÄKTA avant 25	28930842
ÄKTAexplorer 10S			
ÄKTAexplorer 100	▶	ÄKTA avant 150	28976337
ÄKTAexplorer 100 Air			
ÄKTAFFPLC	▶	ÄKTA pure 25 L	29018224
ÄKTApurifier UPC 10		ÄKTA pure 25 L1	29018225
ÄKTApurifier 10	▶	ÄKTA pure 25 M	29018226
ÄKTApurifier 10 plus		ÄKTA pure 25 M1	29018227
ÄKTApurifier 10 plus		ÄKTA pure 25 M2	29018228
ÄKTApurifier UPC 100	▶	ÄKTA pure 150 L	29046665
ÄKTApurifier 100	▶	ÄKTA pure 150 M	29046694
ÄKTApurifier 100 plus		ÄKTA pure 150 M3	29046697
ÄKTAmicro	▶	ÄKTA pure 25 with microgram-scale purification flow path	*

\* Contact your local sales representative for further information.