29219757 **Superdex** 30 Increase 10/300 GL

Instructions for Use

Read these instructions carefully before using the column.

Intended use

Superdex™ 30 Increase 10/300 GL column is intended for research use only, and shall not be used in any clinical or in vitro procedures for diagnostic purposes.

Safety

For use and handling of the product in a safe way, refer to the Safety Data Sheet.

Quick information

Superdex 30 Increase 10/300 GL is a prepacked Tricorn™ glass column. The glass tube is coated with a protective plastic film. The column is suitable for small scale preparative purification (µg-mg) as a final polishing step of polypeptides and other biomolecules, as well as for analysis and characterization.

The column is supplied with two fingertight 1/16" male connectors for connection to ÄKTA™ or other systems.

Table 1. Resin data

Matrix	Composite of cross-linked agarose and dextran
Particle size, d_{50v}[1]	~ 9 µm
Fractionation range	
peptides (M_r)	100 to 7 000
pH stability range	
operational[2]	3 to 12
CIP[3]	1 to 14
Temperature	
operational	4°C to 40°C
storage	4°C to 30°C

[1] Median particle size of the cumulative volume distribution.

[2] pH range where resin can be operated without significant change in function.

[3] pH range where resin can be subjected to cleaning- or sanitization-in-place without significant change in function.

Table 2. Column data

Bed dimensions (mm)	10 × 300-310
Approximate bed volume (mL)	24
Column efficiency (N/m)	> 43 000
Typical pressure drop over packed bed[1]	3.0 MPa[2] (30 bar, 435 psi)
Column hardware pressure limit	5.0 MPa (50 bar, 725 psi)

[1] Determine the limit according to section *Setting column pressure limits, on page 2*.

[2] At maximum flow rate at 25°C in water

Table 3. Flow rate limits and recommendations Superdex 30 Increase 10/300 GL

Temperature		**Flow rate (mL/min)**
20°C to 25°C	Recommended flow rate, water	0.80
	Maximum flow rate, water	1.20
	Maximum flow rate, 20% ethanol	0.60
	Maximum flow rate, 10% glycerol	0.60
	Maximum flow rate, 30% acetonitrile	1.20
	Maximum flow rate, 40% methanol	0.60
4°C to 8°C	Maximum flow rate, water	0.60
	Maximum flow rate, 20% ethanol	0.30
	Maximum flow rate, 10% glycerol	0.30
	Maximum flow rate, 30% acetonitrile	0.60
	Maximum flow rate, 40% methanol	0.30

Note: *Most water based buffers can be considered to be similar to water, for example phosphate and Tris buffers.*

Note: *When running viscous samples (for example containing glycerol) it is important to lower the flow rate, see recommendations above.*

First time use

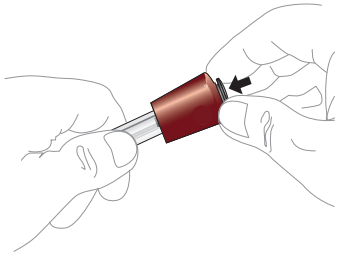


Fig 1. Illustration of how to lock the adapter. The locking ring (black) must be in the down-position to prevent uncontrolled adjustment of the column's bed height.

Before connecting the column to a chromatography system, make sure there is no air in the tubing and valves. Remove the storage/shipping device, see section *Delivery/storage, on page 4*, and the stop plug from the column. Check that the upper adapter is locked (locking ring pressed down, see Fig. 1). Make sure that the column inlet is filled with liquid and connect it drop-to-drop to the system. For maximum resolution, minimize all dead volumes between the injection valve and the column as well as between the column outlet and the detector.

Note: *Buffer solution, column and system should be kept at the same temperature when operating.*

Prepare the column for first-time use as follows:

1. Equilibrate with at least 2 column volumes (CV) of room tempered water at a flow rate of 0.5 mL/min. Be aware to lower the flow rate if run at lower temperature.
2. Set pressure limits for the column in your method according to section *Setting column pressure limits*.
3. Equilibrate with at least 2 CV eluent at a flow rate according to *Table 3, on page 1*.
4. It is recommended to perform a column performance control for future comparisons, see section *Column performance control, on page 3*.

NOTICE
Make sure not to exceed the pressure limits of the column. This is particularly important when working at low temperatures, like in a cold room, or when the column is used with 20% ethanol or other viscous solutions. Set pressure limits according to section *Setting column pressure limits*.

Setting column pressure limits

There are two pressure limits to consider when running the column, the pressure drop over the packed bed and the column hardware pressure limit. The pressure drop over the packed bed differs for each column and the limit has to be individually set **as the column is packed to withstand the maximum flow rate**. Note that it might be different compared to the value noted in *Table 2, on page 1*.

Exceeding any pressure limit may lead to collapse of the column bed or damage to the column hardware. Increased pressure may for example be generated by one or a combination of the following parameters:

- Eluent or sample with high viscosity compared to water. This includes 20% ethanol.
- Low temperature compared to room temperature.
- Modifications to the flow path, for example changing to thinner or longer tubing.

For optimal functionality it is important to know the pressure drops over different parts of your system and how they affect the column. All ÄKTA chromatography systems measure pressure at the system pump, $\mathbf{p_{pump}}$ (see Fig. 2). Some systems have additional pressure sensors located before and after the column, $\mathbf{p_{pre\text{-}c}}$ and $\mathbf{p_{post\text{-}c}}$.

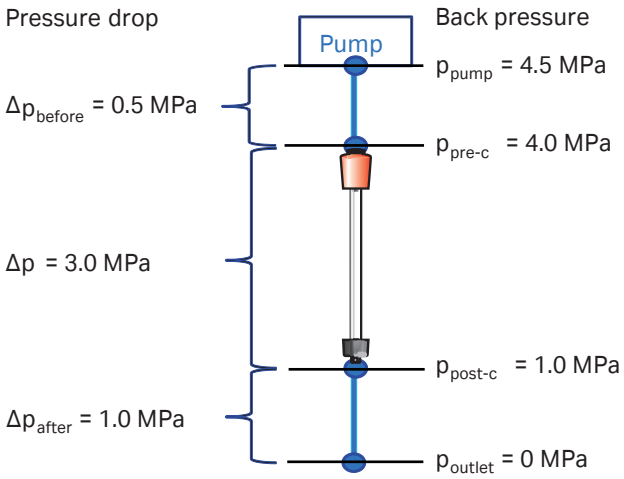


Fig 2. Example of the pressure in different parts of a system during run of a column.

- $\mathbf{\Delta p_{before}}$ does not affect the column.
- The pressure on the column hardware is the sum of $\mathbf{\Delta p_{after}}$ and $\mathbf{\Delta p}$ (on some systems monitored separately as $\mathbf{p_{pre\text{-}c}}$).

  Do not exceed the column hardware limit!
- $\mathbf{\Delta p}$, is individual for each column and needs to be determined.

For more information, refer to the *ÄKTA laboratory-scale Chromatography Systems Instrument Management Handbook*.

How to set pressure limit for ÄKTA explorer, ÄKTA purifier, ÄKTA micro, and other systems with a pressure sensor in the pump

Determination of column specific pressure drop over the packed bed, $\mathbf{\Delta p}$ (see Fig. 2):

Step	Action
1	$\mathbf{\Delta p_{before}}$ is measured in absence of the column. Run the pump at maximum flow rate of the column in water and at the temperature for the experimental conditions. For exact values, see *Table 3, on page 1*. Let the flow drip from the tubing that will later be connected to the column. Note the pressure as $\mathbf{\Delta p_{before}}$.
2	Check that the Pressure Alarm in software is set to the same as the Column hardware pressure limit.

Step	Action
3	Connect the column to the system. Let the flow drip from the column outlet. The column should be equilibrated in water and at the temperature for the experimental conditions. Run the pump at the same flow rate as in step 1. Note the pressure value.
4	**Δp** is calculated as the pressure value in step 3 minus Δp_{before}. The **Δp** value will be used in step 8 below. This **Δp** should not be exceeded at any temperature or using any liquid.

Setting pressure limit in method at your experimental conditions (intended system setup, flow rate, temperature and eluent):

5	Δp_{before} is measured in absence of the column. Run the pump at your intended flow rate. Let the flow drip from the tubing that will later be connected to the column. Note the pressure as Δp_{before}.
6	Instead of the column, connect a piece of tubing[1] to the system. Run the pump at the same conditions as in step 5. Note the pressure value as the total system pressure.
7	Δp_{after} is calculated as the total system pressure value noted in step 6 minus Δp_{before}, noted in step 5.
8	Calculate $\Delta p + \Delta p_{after.} + \Delta p_{before}$ **a.** If this value is lower than the Column hardware pressure limit (see *Table 2, on page 1*), set the pressure limit in your method as $\Delta p + \Delta p_{after.} + \Delta p_{before}$. **b.** If $\Delta p + \Delta p_{after.}$ exceeds the column hardware pressure limit, reduce the flow rate or Δp_{after}. Repeat step 5-8.

You can now start your experiment!

How to set pressure limit for ÄKTA pure, without a column valve or with Column Valve V9-Cs (1 column)

p_{pre-c} (see *Fig. 2, on page 2*) is automatically monitored by the system. This is the pressure signal to use in the following instruction. Do not use the System pressure signal. Note that the measured values include the tubing used to connect the column to the instrument.

Determination of column specific pressure drop over the packed bed (**Δp**):

Step	Action
1	Check that the Alarm pre column pressure in software is set to the same as the Column hardware pressure limit (see *Table 2, on page 1*).
2	Connect the column to the system. Let the flow drip from the column outlet. The column should be equilibrated in water and at the temperature for the experimental conditions. Run the pump at maximum flow rate of the column in water and at the temperature for the experimental conditions. For exact values, see *Table 3, on page 1*. Note the pressure value. The now measured ppre-c value is the maximum pressure over the packed bed, Δp (DeltaC pressure).
3	This **Δp** value should not be exceeded at any temperature or with any liquid!

Setting pressure limit in method at your experimental conditions (intended system setup, flow rate, temperature and eluent):

4	Δp_{after} is measured in absence of the column. Run the pump at your intended flow rate.
5	Instead of the column, connect a piece of tubing[2] to the system, or bypass the column if connected to a valve. Run the pump at your intended flow rate. The now measured value is Δp_{after}.
6	Calculate $\Delta p + \Delta p_{after}$. **a.** If this value is lower than the Column hardware pressure limit (see *Table 2, on page 1*), set the pressure limit in your method, Alarm pre column pressure, as $\Delta p + \Delta p_{after}$. **b.** If $\Delta p + \Delta p_{after}$ exceeds the column hardware pressure limit, reduce the flow rate or Δp_{after}. Repeat step 4-6.

You can now start your experiment!

How to set pressure limit for ÄKTA avant and ÄKTA pure with Column Valve V9-C (5 columns)

Note: *This is not an optimal high performance setup. See Sections System recommendations, on page 4 and System dead volumes, on page 6 for more details.*

Δp and p_{pre-c} (see *Fig. 2, on page 2*) are automatically monitored by the system.

Note: *The measured values include the tubing used to connect the column to the instrument.*

Step	Action
1	Check that the Alarm pre column pressure is set to the same as the Column hardware pressure limit (see *Table 2, on page 1*).
2	Connect the column to the system. The column should be equilibrated in water and at the temperature for the experimental conditions. Start running the column at a low flow rate. Slowly increase the flow until the maximum flow rate for the column under these conditions or the limit set in step 1 is reached. For exact maximum flow rates under different conditions, see *Table 3, on page 1*. Note the pressure over the packed bed, Δp (delta-column pressure), and set the value as Alarm Delta column pressure. This **Δp** should not be exceeded at any temperature or with any liquid.

You can now start your experiment!

Column performance control

In order to detect any changes in column performance, it is very important that you make an initial column test with your particular system configuration. Note that the contribution from dead volumes in the instrument to band broadening will vary depending on system set-up and will influence column efficiency. The obtained efficiency on your system might be lower compared to the specifications in *Table 2, on page 1*.

1 Avoid thin and/or long tubing that will give back pressure.
2 Avoid thin and/or long tubing that will give back pressure.

Column efficiency test

Column efficiency, expressed as the number of theoretical plates per meter, N/m, is calculated using the following equation:

$N/m = 5.54 \times (V_R / W_h)^2 / L)$

Where

N/m	=	number of theoretical plates/meter
V_R	=	volume eluted from the start of sample application to the peak maximum
W_h	=	peak width measured as the width of the recorded peak at half of the peak height
L	=	bed height (m)

Check the performance of the column using the following procedure:

Sample:	100 µL 2% acetone (20 mg/mL) in buffer or water
Eluent:	Buffer or water
Flow rate:	0.75 mL/min, room temperature
Detection:	280 nm

Function test

As an alternative to the above efficiency test, check the column performance by running a function test.

Sample:	1. Cytochrome C (M_r 12 400) 0.2 mg/mL 2. Aprotinin (M_r 6 500) 0.2 mg/mL 3. Vitamin B12 (M_r 1 355) 0.07 mg/mL 4. Triglycine (M_r 189) 0.2 mg/mL 5. Glycine (M_r 75) 7 mg/mL The proteins/peptides were diluted in 2×PBS
System:	ÄKTA pure 25
Sample volume:	100 µL
Eluent:	2×PBS (0.02 M phosphate buffer, 0.28 M NaCl, 0.006 M KCl, pH 7.4)
Flow rate:	0.8 mL/min, room temperature
Detection:	214 nm

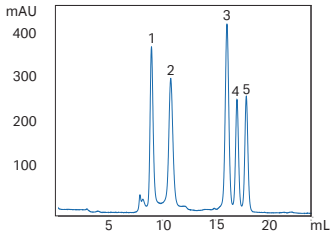


Fig 3. Typical chromatogram from a function test of Superdex 30 Increase 10/300 GL.

Try these conditions first

Eluent:	2×PBS (0.02 M phosphate buffer, 0.28 M NaCl, 0.006 M KCl, pH 7.4)
Flow rate: (room temperature)	0.80 mL/min
Sample volume:	100 µL

Equilibration is not necessary between runs with the same buffer. Read the section *Optimization, on page 6* for information on how to optimize a separation.

Sample recommendations

Molecular weight (M_r):	100 to 7 000
Protein concentration:	Up to 10 mg/mL.
Sample volume:	25 to 500 µL
Preparation:	The sample should be fully soluble in the eluent used. Filter through a 0.22 µm filter or centrifuge at 10 000 g for 10 min.

Note: *High sample viscosity (high protein concentration or additives) can cause instability of the separation and the back pressure might increase. Dilute sample or decrease flow rate during sample application.*

System recommendations

The 10/300 column can be used in systems like ÄKTA purifier 10, ÄKTA explorer 10, ÄKTA micro, ÄKTA pure 25 and ÄKTA avant 25. The column can also be used with HPLC systems.

Consider actions to reduce system dead volumes if sufficient performance is not achieved. For optimal configuration of ÄKTA pure 25, see Cue cards in the Literature list in Section *Ordering information, on page 7*.

ÄKTA start is not compatible with Superdex 30 Increase columns due to too low maximum operating pressure.

Superdex 30 Increase 10/300 GL on different systems

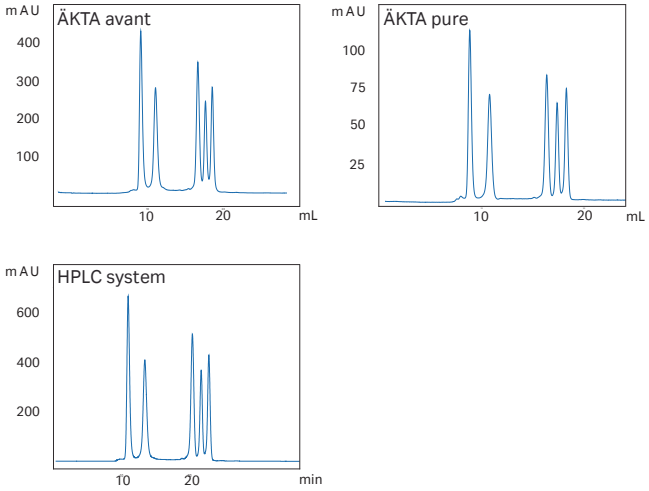


Fig 4. Comparison of protein separation on Superdex 30 Increase 10/300 GL on different systems, an HPLC system, ÄKTA pure 25 and ÄKTA avant 25.

Delivery/storage

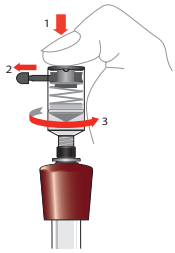
The column is delivered with a storage/shipping device that prevents it from drying out. The column is equilibrated with degassed 20% ethanol.

If the column is to be stored for more than 2 days after use, wash the column with 2 column volumes (CV) of water and then equilibrate with at least 2 CV 20% ethanol.

Note: *Use flow rate for 20% ethanol according to Table 3, on page 1.*

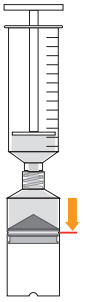
For long term storage, we recommend that you connect the storage/shipping device according to Section *How to connect the storage/shipping device* for long term storage.

How to remove the storage/shipping device



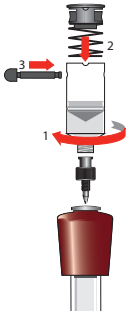
1. Push down the spring-loaded cap.
2. Remove the locking pin.
3. Release the cap and unscrew the device.

How to refill the storage/shipping device



1. Connect a syringe or pump to the storage/shipping device and fill with 20% ethanol over the mark on the tube. Remove the syringe or connection to the pump.
2. Tap out air bubbles and push the plunger to the mark on the device.

How to connect the storage/shipping device



1. Fill the column inlet and luer connector with 20% ethanol and connect the filled storage/shipping device drop-to-drop to the top of the column.
2. Mount the spring-loaded cap (2) and secure it with the locking pin (3).

The glass tube is coated with a protecting plastic film. Small quantities of air may occasionally be trapped between the glass and the film during manufacturing. The resulting uneven surface does not affect column performance or durability.

Choice of eluent

Select an eluent that ensures the sample is fully soluble. Also try to choose an eluent that will simplify downstream applications. For example, if the proteins/peptides are to be lyophilized, a volatile eluent is necessary. Since ionic interactions can occur with both acidic and basic proteins at very low salt concentrations, a recommended buffer is 0.01 to 0.05 M sodium phosphate with additional 0.15-0.3 M NaCl, pH 7.4. For hydrophobic peptides, addition of organic solvent can be beneficial. Table 4 lists some useful eluent compositions.

Table 4. Useful eluent compositions

pH	Buffer/eluent	Properties/application examples
1.3	0.05 M HCl	Good solubility for peptides. Good UV transparency.
5.0	0.1 M ammonium acetate	Volatile.
7.2	0.05 M phosphate + 0.15 M NaCl	Physiological conditions. Very good solubility for DNA and RNA
7.8	0.15 M ammonium hydrogen carbonate	Volatile. Should be used fresh
-	Acetonitrile 30% + TFA 0.1%	For separating hydrophobic compounds.
Buffer additives		**Properties/application examples**
Up to 8 M urea (pH<7)		Good solubility for many components. Biological activity can be maintained at lower urea contents. Certain risk for carbamylation of proteins.
6 M guanidine hydrochloride		Dissociate hydrogen bonds and minimize secondary structure.
0.1% SDS, Tween™ or similar		Good solubility for some proteins, e.g., membrane proteins. Make sure you equilibrate completely with the detergent solution. Thoroughly remove the detergent with, e.g., 70% ethanol before doing separations without detergent.
0.2 M arginine		Decreases tendency of aggregation.
Organic solvent. E.g., 30% acetonitrile		Reduces hydrophobic interaction.

Buffers and solvent resistance

De-gas and filter all solutions through a 0.22 µm filter. Install an on-line filter before the injection valve.

Note: *Buffers and solvents with increased viscosity will affect the back pressure. Reduce the flow rate if necessary, see* *Table 3, on page 1*.

Long term use

Long term use refers to use where the medium is stable over a long period of time without adverse side effects on its chromatographic performance.

- Trifluoroacetic acid, up to 0.2%
- Isopropanol, up to 5%
- Dithiothreitol (DTT), up to 5 mM
- Acetonitrile, up to 70%
- Formic acid, up to 1%
- All commonly used aqueous buffers, pH 3 to 12
- Urea, up to 8 M
- Guanidine hydrochloride, up to 6 M
- Ionic and non-ionic detergents, e.g., 1% SDS

- Methanol, up to 70%

Short term use

Short term use refers to the use during regeneration, cleaning-inplace, and sanitization procedures.

- Sodium hydroxide, up to 1 M
- Ethanol, up to 70%
- Isopropanol, up to 30%
- Hydrochloric acid, up to 0.1 M
- Trifluoroacetic acid, up to 1%
- Dimethyl sulfoxide (DMSO), up to 10%

Avoid:

- Oxidizing agents
- Non-filtered samples and eluents

Optimization

If your results are unsatisfactory, consider the following actions. For more information, see also the Literature list in Section *Ordering information, on page 7*.

Flow rate

Action: Decrease the flow rate.

Effect: Generally improves resolution.

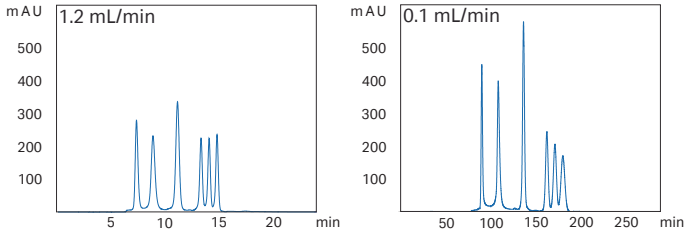


Fig 5. Comparison of peptide separation on Superdex 30 Increase 10/300 GL at different flow rates.

Sample volume

Action: Decrease the sample volume.

Effect: Improves resolution.

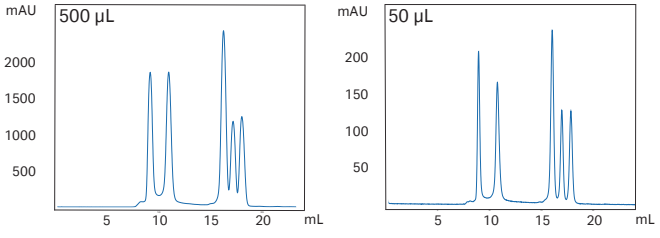


Fig 6. Comparison of peptide separation on Superdex 30 Increase 10/300 GL using different sample volumes.

System dead volumes

Action: Decrease system dead volumes e.g., by using a column valve with low inner volume (or no valve) and using short, narrow-diameter capillaries. Be aware that column bypass is not available without a column valve.

Effect: Improves resolution.

For further information about configuration of ÄKTA pure 25, see Cue Cards in the Literature list in Section *Ordering information, on page 7*.

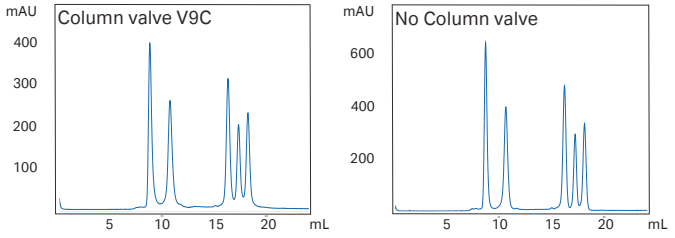


Fig 7. Comparison of peptide separation on Superdex 30 Increase 10/300 GL with ÄKTA pure 25 using either column valve V9-C or without column valve.

Columns in tandem

Action: Connect two columns in series.

Effect: Increases resolution due to increased bed height. Back pressure will increase. Be sure not to exceed maximum pressure limits. See comparison example in Instructions for Superdex 200 Increase (Instruction 29027271).

Eluent composition

Action: Add organic solvent.

Effect: Suppresses hydrophobic interactions. Increases solubility of hydrophobic compounds. May change selectivity.

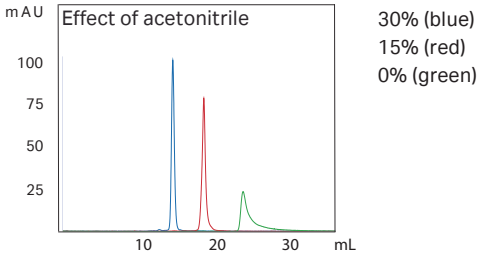


Fig 8. Elution profiles of somatostatin separated in 50 mM sodium phosphate, 250 mM NaCl, pH 7.4 with different concentrations of acetonitrile.

Action: Change pH.

Effect:A pH change alters the polypeptide net charge. This can affect ionic and hydrophobic interactions.

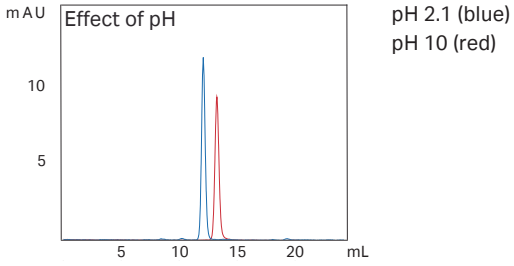
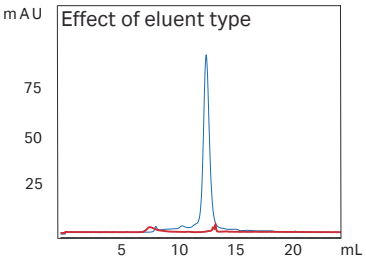


Fig 9. Elution profiles of gastrin separated in 50 mM $NaPO_4$, 250 mM NaCl, 30% acetonitrile at different pH.

Action: Change type of eluent.

Effect: Increased ionic strength suppress ionic interaction with the resin. Note that some proteins might precipitate at low ionic strength. Buffering capacity maintain constant pH and prevents inactivation or precipitation.



Phosphate buffer with salt and organic solvent (blue)
Organic solvent with ion-pair reagent (red)

Fig 10. Elution profiles of aprotinin in 20 mM $NaPO_4$ buffer, 280 mM NaCl, 30% acetonitrile, pH 7.4 and 30% acetonitrile + 0.1%TFA.

For more information, see also the Literature list in Section *Ordering information, on page 7*.

Cleaning-in-place (CIP)

Perform the following regular cleaning cycle after 10 to 20 separation cycles, or when otherwise needed.

Note: *When performing CIP, reversed flow is recommended.*

Note: *For storage after CIP procedure be sure to rinse with buffer back to neutral pH before transferring to 20% ethanol.*

Regular cleaning

1. Wash the column with 1 column volume (CV) of 0.5 M sodium hydroxide, 0.5 M acetic acid, or 30%-70% acetonitrile at a flow rate of 0.5 mL/min.
2. Immediately rinse the column with 1 CV water followed by at least 2 CV of buffering eluent at a flow rate of 0.5 mL/min.

Before the next run, equilibrate the column until the UV baseline and pH are stable. Check the column according to Section *Column performance control, on page 3* that the performance is restored.

More rigorous cleaning

- Depending on the nature of the contaminants, one of the cleaning solutions in the Section *Buffers and solvent resistance, on page 5* may be used. Always rinse with at least 2 CV water after any of the cleaning solution has been used, followed by 2 CV of buffering eluent.
- If column performance is not restored, wash the column with 3 CV 0.5 M arginine. Rinse with at least 2 CV water.
- If column performance is still not restored, fill the column with a solution of 1 mg/mL pepsin in 0.1 M acetic acid containing 0.5 M NaCl and leave overnight at room temperature or one hour at 37ºC. After enzymatic treatment, clean the column according to the procedure described in the Section *Regular cleaning*.
- Change the filter at the top of the column. (Since contaminants are introduced with the liquid flow, many of them are caught by the filter). Instructions for changing the filter are supplied with the Filter Kit. Perform a regular cleaning as described above.
- If necessary, carefully suspend 2 to 3 mm of the top of the gel bed and remove it with a Pasteur pipette. Adjust the adapter to eliminate the space above the gel. (Longer adapters than the original ones are available, see *Ordering information, on page 7*.)

Troubleshooting

Symptom	Remedy
Obtained column efficiency is not the same as in the column specification.	Result for column efficiency depends on the system and cannot be expected to be the same. Use the column efficiency for later comparisons in order to detect changes in column performance.
Increased back-pressure over the column and/or loss of resolution.	Confirm that the column is the cause (see below). If so, clean it according to the procedure described in Section *Cleaning in place (CIP)*. To confirm that the high back-pressure in the system is caused by the column, disconnect one piece of equipment at a time (starting at the fraction collector) with the pumps running. Check the pressure reading after each piece has been disconnected to determine the source of the back-pressure.
Peak of interest is poorly resolved from other peaks.	Too high flow rate: Reduce flow rate. Too high sample volume: Reduce sample volume. Large extra-column volume: Minimize extra column volume in tubings, components and connections. Decrease gap, see below.
Air in the column	Note that small amounts of air will normally not affect the performance of the column. Run 3 to 4 column volumes (CV) of well de-gassed eluent in an upflow direction at a flow rate of 0.5 mL/min at room temperature.
Space between gel bed and adapter	Turn down the adapter to the gel bed. (Longer adapters than the original ones are available, see *Ordering information*.) Perform a Column performance control.
Other problems	See the handbook *Size Exclusion Chromatography, Principles & Methods*.

Ordering information

Product	Quantity	Product code
Superdex 30 Increase 10/300 GL	1	29219757

Related products

Product	Quantity	Product code
Superdex 30 Increase 3.2/300 GL	1	29219758
Superdex 75 Increase 3.2/300 GL	1	29148723
Superdex 75 Increase 10/300 GL	1	29148721
Superdex 75 Increase 5/150 GL	1	29148722
Superdex 200 Increase 10/300 GL	1	28990944
Superdex 200 Increase 5/150 GL	1	28990945

Superdex 200 Increase 3.2/300	1	28990946
Superose™ 6 Increase 10/300 GL	1	29091596
Superose 6 Increase 5/150 GL	1	29091597
Superose 6 Increase 3.2/300	1	29091598
Gel filtration LMW Calibration Kit	1	28403841

Accessories

Product	Quantity	Product code
Tricorn 10 Filter Kit	1	29053612
Filter tool	1	18115320
Fingertight connector, 1/16" male	10	18111255
Tricorn storage/shipping device	1	18117643
(Long) Tricorn 10 adapter unit	1	28406407

Literature

Document	Product code
Instruction: *Superdex 200 Increase*	29027271
Size Exclusion Chromatography, Principles & Methods	18102218
ÄKTA laboratory-scale Chromatography Systems Instrument Management Handbook	29010831
Procedure: *Maintenance and cleaning of size exclusion chromatography columns*	29140760
Cue Cards: *Optimal configuration of ÄKTA pure 25 for small scale SEC*	29181181

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