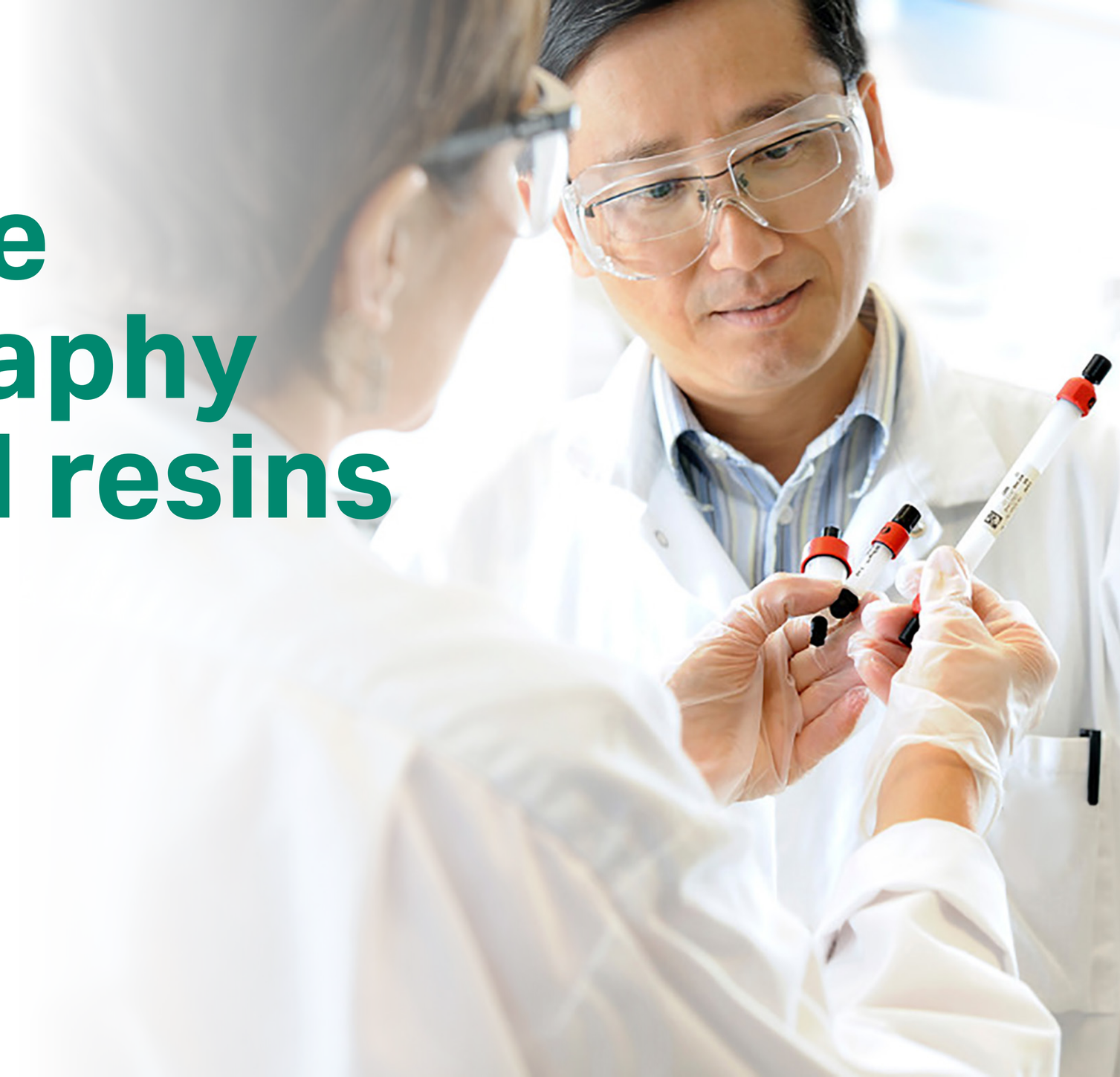
Selection guide

Ion exchange chromatography columns and resins



cytiva

Introduction to ion exchange chromatography

What is ion exchange (IEX) chromatography?

IEX is a liquid chromatography technique to separate proteins that have only slight differences in their net surface charge. Even very closely related proteins will have some difference in charge and can be effectively separated using this purification method.

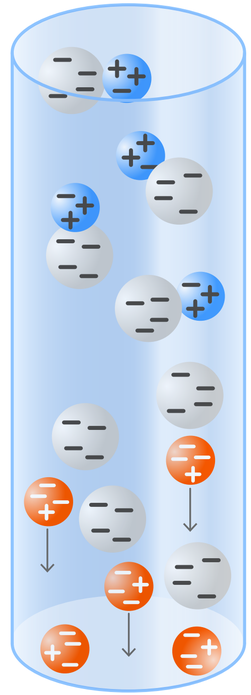
The chromatography technique is based on the interaction of a charged molecule and the oppositely charged chromatography resin.

This chromatography technique takes advantage of the fact that the relationship between net surface charge and pH is unique for a specific protein.

Typically, conditions are selected to ensure that the molecules of interest bind to the resin as they are loaded onto the column.

Conditions are then altered so that the bound substances are eluted differently.

IEX is performed in four main steps as shown below.



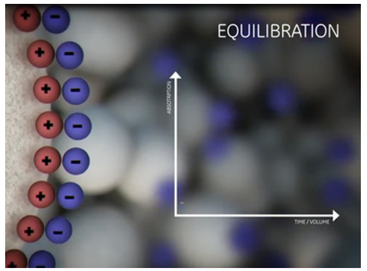
Positively charged protein (blue) binds to negatively charged resin beads (gray)

Negatively charged protein (orange) flows through

Fig 1. Ion exchange chromatography using a cation exchanger.

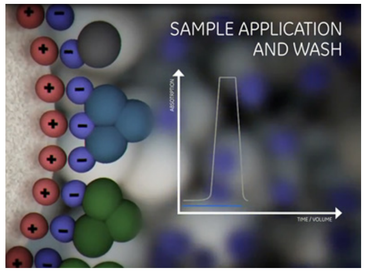
How does ion exchange chromatography work?

1. Equilibration



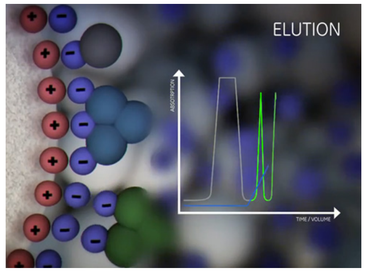
Prepare the column to the desired start conditions.

2. Sample application and wash



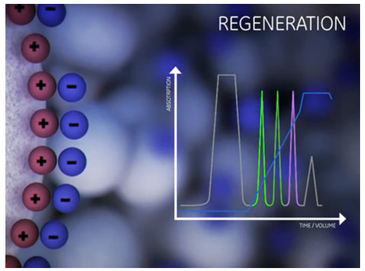
Bind the target molecules and wash out all unbound material.

3. Elution



Biomolecules are gradually released from the ionic exchanger by a change in the buffer composition.

4. Regeneration



Removal of all molecules still bound.

Fig 2. Main steps of an ion exchange chromatography run.

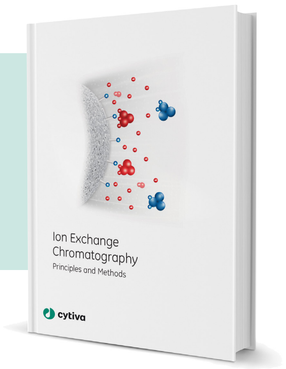
Select your ion exchange chromatography resin

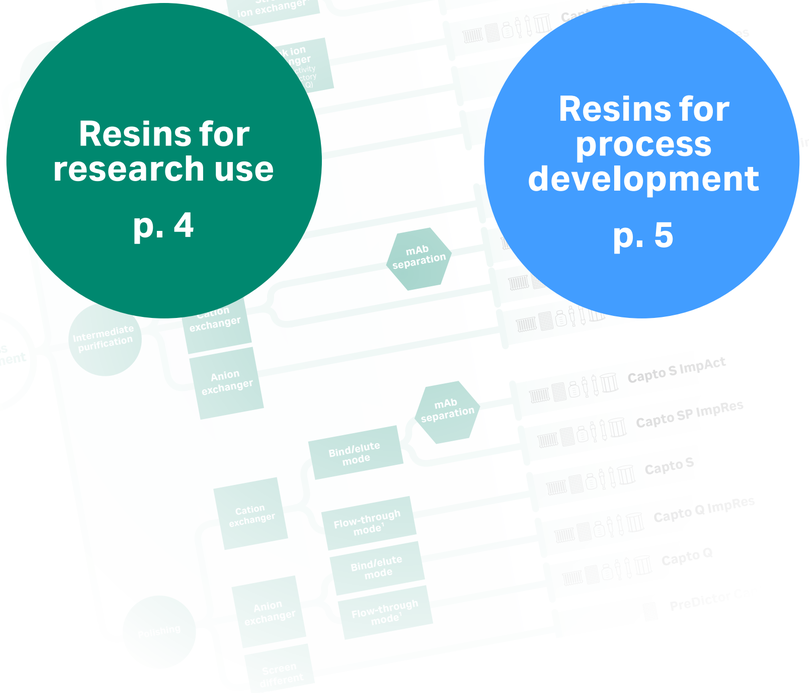
Select the chromatography resin according to the objective of the purification step and the condition of the starting material. Other factors such as sample stability, scale, speed, binding capacity, and equipment available may also influence the final choice. Use the decision trees on pages 4 and 5 to find the most appropriate resin for your needs.

Ion exchange chromatography handbook

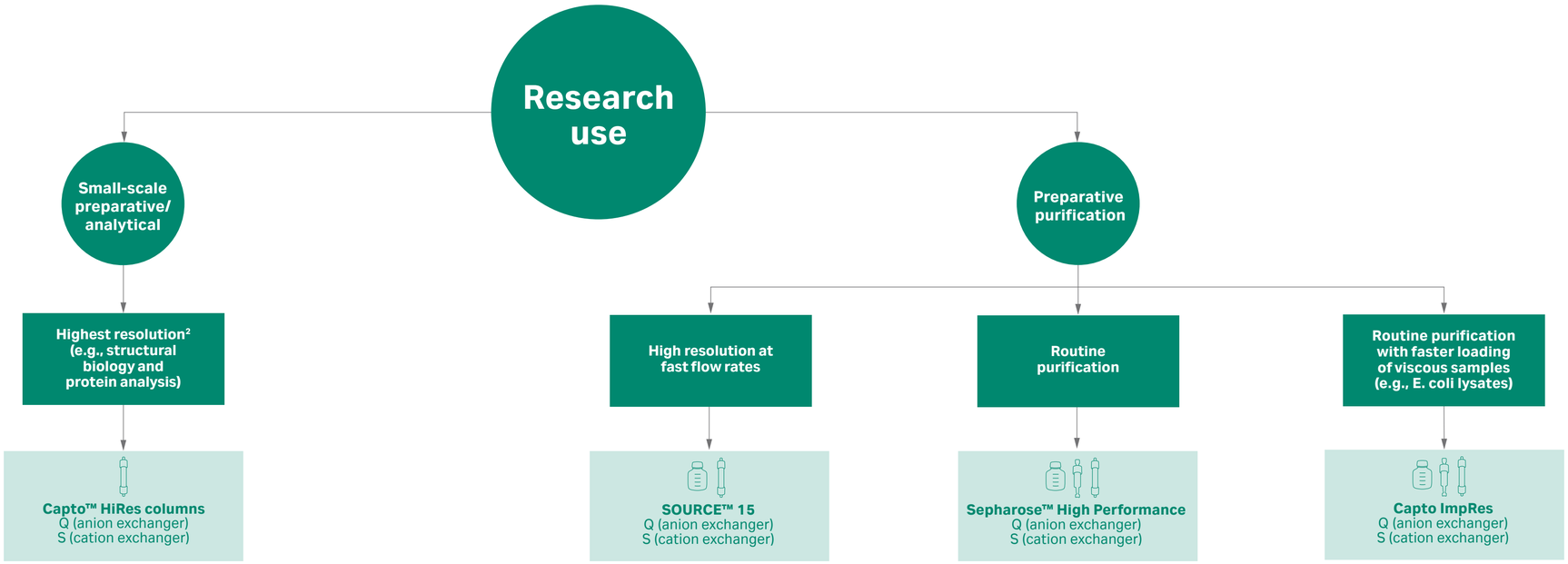
Looking for protocols and tips for using ion exchange chromatography?

Download our handbook from **cytiva.com/handbooks**

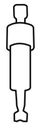




Guide to IEX resins for research applications[1]



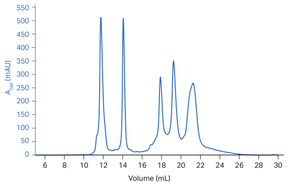
Format guide

Type of purification	Manual or system purification				System purification	
Format		Bottles of chromatography resins		Small-column cartridges (1 and 5 mL)		Other columns
Format name		Lab pack		HiTrap™		HiScreen™, HiPrep™, RESOURCE, Tricorn™
Use		Batch purification and packing empty columns		Easy to use with a syringe, peristaltic pump, or a chromatography system		Larger scale or high-performance applications

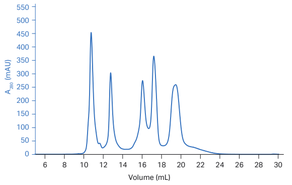
[1] *This resin selection is our recommendation for the most common needs in research. For a complete list of products, refer to the ordering information table*

[2] *Compared with other IEX columns from Cytiva*

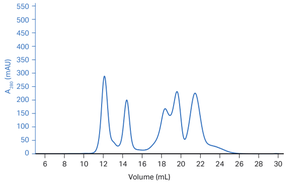
[3] *Protein mix purified at 1 mL/min and containing: Apotransferrin, α–Lactalalbumin, β-Lactoglobulin, Amyloglucosidase*



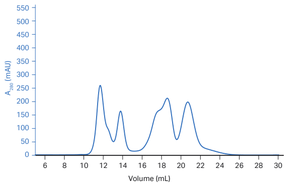
Separation[3] on a Capto HiRes Q 5/50 column



Separation[3] on a RESOURCE™ Q 1mL column (SOURCE 15 resin)

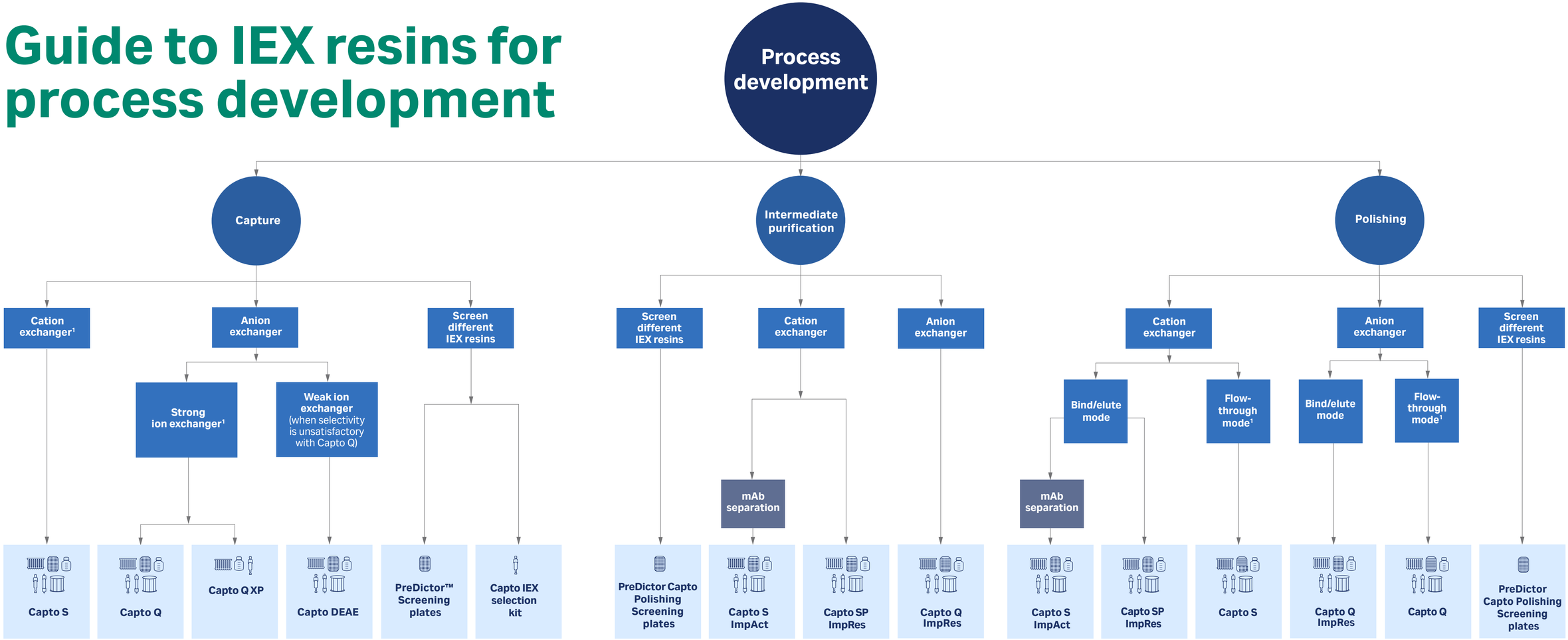


Separation[3] on a HiTrap Q HP 1mL column (Sepharose High Performance resin)



Separation[3] on a HiTrap Capto Q ImpRes 1 mL column

Guide to IEX resins for process development



Format guide

Format		96-well filter plates (2, 6, 20, or 50 µL)		Miniaturized prepacked columns (50, 200, and 600 µL)	Bottles of chromatography resins
Format name		PreDictor		PreDictor RoboColumn™	Bulk pack
Application		High-throughput screening		High-throughput process development	Batch purification and self-packing

Format		Prepacked columns (1 and 5 mL)		Prepacked columns (4.7 mL with 10 cm bed height)	Single-use, prepacked columns ≥ 1 L
Format name		HiTrap		HiScreen	ReadyToProcess™[2]
Application		Process development, screening		Method optimization	Clinical manufacturing

[1] *We also offer solutions based on membrane adsorbers technology. Contact your sales representative.*

[2] *For more information about ReadyToProcess columns, contact your sales representative*

Which ion exchanger should be used?

What is the pI of a protein?

The isoelectric point (pI) is the pH at which a protein has no net charge. A protein that has no net charge at a pH equivalent to its pI will not interact with a charged resin. However, at a pH above its pI, a protein will bind to a positively charged resin (anion exchanger). At a pH below its pI, a protein will bind to a negatively charged resin (cation exchanger, see Fig 3).

Guidance for ion exchanger selection

If isoelectric point (pI) of the target protein is known:

- Select an anion exchanger (Q, DEAE) with a buffer pH above the pI.
- Select a cation exchanger (S, SP, CM) with a buffer pH below the pI.

If pI is unknown:

Starting with a strong exchanger (Q, S, SP) is recommended.

Strong ion exchangers maintain their charge over a wider pH range than weak ion exchangers and are suitable for most applications.

Consider using a weak exchanger (DEAE, CM) if the selectivity of the strong ion exchanger is unsatisfactory, but remember that the ion exchange capacity of a weak ion exchanger varies with pH.

Table 1. Overview of ion exchange groups on our resins

Ion exchanger type		Ion exchange group	Description
Strong	Anion exchanger	Q	Quaternary ammonium
	Cation exchanger	SP	Sulfopropyl
		S	Methyl sulfonate
Weak	Anion exchanger	DEAE	Diethylaminoethyl
	Cation exchanger	CM	Carboxymethyl

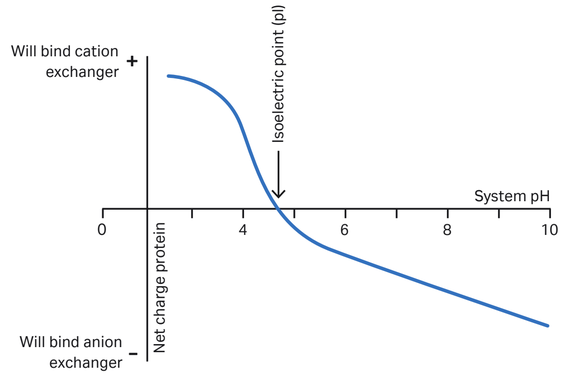


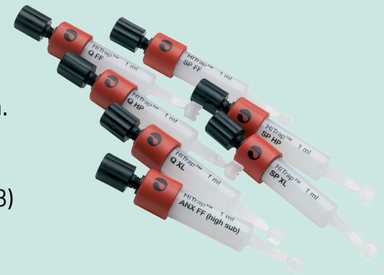
Fig 3. The net surface charge of a protein is highly pH dependent and will change gradually as the pH of the environment changes.

Good to know!

Our IEX selection kits help you screen for the optimal charged group for a given application.

- HiTrap IEX Selection Kit (17600233)
- HiTrap Capto IEX Selection Kit (28934388)

More on page 12.



Select the format according to your need

	 Resin in bulk	 HiTrap	 RESOURCE	 HiPrep	 Tricorn (glass)	 Tricorn (PEEK)*	 HiScreen	 PreDictor plates	 PreDictor RoboColumn units
Applications									
Small-scale preparative purification	●	●	●	●	●	●	●	●	●
Protein analysis					●	●			
Process development	●	●					●	●	●
High-throughput screening	●							●	●
Scale-down studies	●				●				
Use									
Syringe		●							
Peristaltic pump	●	●							
Centrifuge	●							●	
Multichannel pipette								●	
Robotic liquid handling system	●							●	●
Chromatography systems	●	●	●	●	●	●	●		

** PEEK = Polyetherketone*

If you need further guidance for product selection, check our digital selection tool **cytiva.com/purify**

Ordering information

Resin	Main feature	Particle size, d_{50V}*	Ligand	Ion exchanger	pH (operational)	Examples of dynamic binding capacities	Column format	Product name	Volume	Column dimensions d × h (mm)	Recommended flow rates	Max pressure over packed bed (MPa)	Pack size	Product code
Capto HiRes	Our highest resolution IEX resin available in several prepacked formats†	8 µm	Q	Strong anion	2 to 12	BSA 50 mg/mL resin	Tricorn glass column	Capto HiRes Q 5/50	1 mL	5 × 50	0.5 to 2.0 mL/min	4	1 column	29275878
								Capto HiRes Q 10/100	8 mL	10 × 100	0.5 to 2.0 mL/min	4	1 column	29275881
			S	Strong cation				Capto HiRes S 5/50	1 mL	5 × 50	0.5 to 2.0 mL/min	4	1 column	29275877
								Capto HiRes S 10/100	8 mL	10 × 100	0.5 to 2.0 mL/min	4	1 column	29275879
SOURCE 15	A high resolution resin that has high flow rates	15 µm	Q	Strong anion	2 to 12	BSA 45 mg/mL resin	RESOURCE PEEK column	RESOURCE Q 1 mL	1 mL	6.4 × 30	1 to 10 mL/min	1.5	1 column	17117701
								RESOURCE Q 6 mL	6 mL	16 × 30	1 to 60 mL/min	0.6	1 column	17117901
							Tricorn PEEK column	SOURCE 15 Q 4.6/100 PE	1.7 mL	4.6 × 100	0.5 to 2.5 mL/min	4	1 column	17518101
							Resin in bulk	SOURCE 15 Q	50 mL	N/A	150 to 900 cm/h	0.5	1 bottle	17094701
									200 mL				1 bottle	17094705
			S	Strong cation	2 to 13	Lysozyme 80 mg/mL resin	RESOURCE PEEK column	RESOURCE S 1 mL	1 mL	6.4 × 30	1 to 10 mL/min	1.5	1 column	17117801
								RESOURCE S 6 mL	6 mL	16 × 30	1 to 60 mL/min	0.6	1 column	17118001
							Tricorn PEEK column	SOURCE 15 S 4.6/100 PE	1.7 mL	4.6 × 100	0.5 to 2.5 mL/min	4	1 column	17518201
							Resin in bulk	SOURCE 15 S	50 mL	N/A	150 to 900 cm/h	0.5	1 bottle	17094401
									200 mL				1 bottle	17094405
SOURCE 30	Use for intermediate purification and large-scale polishing	30 µm	Q	Strong anion	2 to 12	HSA 50 mg/mL resin	Resin in bulk	SOURCE 30 Q	50 mL	N/A	300 to 1000 cm/h	0.3	1 bottle	17127501
									200 mL				1 bottle	17127502
			S	Strong cation	2 to 13	Lysozyme 80 mg/mL resin		SOURCE 30 S	50 mL	N/A	300 to 1000 cm/h	0.3	1 bottle	17127301
									200 mL				1 bottle	17127302
Sepharose High Performance (HP)	Use this resin for routine use in lab or for resin selection and pH scouting	34 µm	Q	Strong anion	2 to 12	BSA 70 mg/mL resin	HiTrap column	HiTrap Q HP	1 mL	7 × 25	up to 1 mL/min	0.3	1 column	29051325
									1 mL	7 × 25	up to 1 mL/min	0.3	5 columns	17115301
									5 mL	16 × 25	up to 5 mL/min	0.3	5 columns	17115401
							HiScreen column	HiScreen Q HP	4.7 mL	7.7 × 100	0.6 mL/min	0.3	1 column	28950511
							HiPrep column	HiPrep Q HP 16/10	20 mL	16 × 100	1 to 5 mL/min	0.3	1 column	29018182
							Resin in bulk	Q Sepharose HP	75 mL	N/A	up to 150 cm/h	0.3	1 bottle	17101401
			SP	Strong cation	4 to 13	Ribonuclease 55 mg/mL resin	HiTrap column	HiTrap SP HP	1 mL	7 × 25	up to 1 mL/min	0.3	1 column	29051324
									1 mL	7 × 25	up to 1 mL/min	0.3	5 columns	17115101
									5 mL	16 × 25	up to 5 mL/min	0.3	5 columns	17115201
							HiScreen column	HiScreen SP HP	4.7 mL	7.7 × 100	0.6 mL/min	0.3	1 column	28950515
							HiPrep column	HiPrep SP HP 16/10	20 mL	16 × 100	1 to 5 mL/min	0.3	1 column	29018183
							Resin in bulk	SP Sepharose HP	75 mL	N/A	up to 150 cm/h	0.3	1 bottle	17108701

** Median particle size of the cumulative volume distribution*

† Capto HiRes replaces MonoBeads resin

Ordering information

Resin	Main feature	Particle size, d_{50V}*	Ligand	Ion exchanger	pH (operational)	Examples of dynamic binding capacities	Column format	Product name	Volume	Column dimensions d × h (mm)	Recommended flow rates	Max pressure over packed bed (MPa)	Pack size	Product code
Capto ImpRes	High resolution and throughput, flexibility of process design	40 µm	Q	Strong anion	2 to 12	BSA > 55 mg/mL resin	HiTrap column	HiTrap Capto Q ImpRes	1 mL	7 × 25	up to 1 mL/min	0.5	5 columns	17547051
									5 mL	16 × 25	up to 5 mL/min	0.3	5 columns	17547055
							HiScreen column	HiScreen Capto Q ImpRes	4.7 mL	7.7 × 100	1.2 mL/min	0.4	1 column	17547015
							PreDictor 96-well filter plates	PreDictor Capto Q ImpRes	6 µL	N/A	N/A	N/A	4 × 96-well filter plates	17547016
									20 µL				4 × 96-well filter plates	17547017
							PreDictor RoboColumn	PreDictor RoboColumn Capto Q ImpRes	200 µL	N/A	N/A	N/A	row of 4 columns	28996918
									600 µL				row of 4 columns	28997391
							Resin in bulk	Capto Q ImpRes	25 mL	N/A	300 cm/h	0.3	1 bottle	17547010
									100 mL				1 bottle	17547002
			SP	Strong cation	4 to 12	Lysozyme > 70 mg/mL resin	HiTrap column	HiTrap Capto SP ImpRes	1 mL	7 × 25	up to 1 mL/min	0.5	5 columns	17546851
									5 mL	16 × 25	up to 5 mL/min	0.3	5 columns	17546855
							HiScreen column	HiScreen Capto SP ImpRes	4.7 mL	7.7 × 100	1.2 mL/min	0.4	1 column	17546815
							Tricorn glass column	Capto SP ImpRes Validation column	15.7 mL	10 × 200	0.5 to 6.6 mL/min	Supplied in column certificate	1 column	29315186
							PreDictor 96-well filter plates	PreDictor Capto SP ImpRes	6 µL	N/A	N/A	N/A	4 × 96-well filter plates	17546816
									20 µL				4 × 96-well filter plates	17546817
								PreDictor Capto SP ImpRes Isotherm	2, 4, 6, 8, 20 and 50 µL				4 × 96-well filter plates	17546818
							PreDictor RoboColumn	PreDictor RoboColumn Capto SP ImpRes	200 µL	N/A	N/A	N/A	row of 4 columns	28997449
									600 µL				row of 4 columns	28997450
							Resin in bulk	Capto SP ImpRes	25 mL	N/A	300 cm/h	0.3	1 bottle	17546810
									100 mL				1 bottle	17546802
Capto S ImpAct	Use Capto S ImpAct for efficient aggregate removal at high load of monoclonal antibodies	50 µm	S	Strong cation	4 to 12	mAb > 100 mg/mL resin	HiTrap column	HiTrap Capto S ImpAct	1 mL	7 × 25	up to 1 mL/min	0.3	5 columns	17371751
									5 mL	16 × 25	up to 5 mL/min	0.3	5 columns	17371755
							HiScreen column	HiScreen Capto S ImpAct	4.7 mL	7.7 × 100	1.2 mL/min	0.4	1 column	17371747
							Tricorn glass column	Capto S Impact Validation column	15.7 mL	10 × 200	0.5 to 6.6 mL/min	Supplied in column certificate	1 column	29321910
							PreDictor 96-well filter plates	PreDictor Capto S ImpAct	6 µL	N/A	N/A	N/A	4 × 96-well filter plates	17546816
									20 µL				4 × 96-well filter plates	17546817
							PreDictor RoboColumn	PreDictor RoboColumn Capto S ImpAct	200 µL	N/A	N/A	N/A	row of 4 columns	17371771
									600 µL				row of 4 columns	17371772
							Resin in bulk	Capto S ImpAct	25 mL	N/A	220 cm/h	0.3	1 bottle	17371701
									100 mL				1 bottle	17371702

* *Median particle size of the cumulative volume distribution*

† *Capto HiRes replaces MonoBeads resin*

Ordering information

Resin	Main feature	Particle size, d_{50V}*	Ligand	Ion exchanger	pH (operational)	Examples of dynamic binding capacities	Column format	Product name	Volume	Column dimensions d × h (mm)	Recommended flow rates	Max pressure over packed bed (MPa)	Pack size	Product code
Capto	High volume throughput and high capacity. Easy scale-up	90 µm	Q	Strong anion	2 to 12	BSA > 100 mg/mL resin	HiTrap column	HiTrap Capto Q	1 mL	7 × 25	up to 1 mL/min	0.3	5 columns	11001302
									5 mL	16 × 25	up to 5 mL/min	0.3	5 columns	11001303
							HiScreen column	HiScreen Capto Q	4.7 mL	7.7 × 100	2.3 mL/min	0.3	1 column	28926978
							Tricorn glass column	Capto Q Validation column	15.7 mL	10 × 200	0.5 to 6.6 mL/min	Supplied in column certificate	1 column	29363635
							PreDictor 96-well filter plates	PreDictor Capto Q	2 µL	N/A	N/A	N/A	4 × 96-well filter plates	28925773
									20 µL				4 × 96-well filter plates	28925806
									50 µL				4 × 96-well filter plates	28925807
								PreDictor Capto Q Isotherm	2, 4, 6, 8, 20 and 50 µL				4 × 96-well filter plates	28943278
							PreDictor RoboColumn	PreDictor RoboColumn Capto Q	200 µL	N/A	N/A	N/A	row of 4 columns	28986072
									600 µL				row of 4 columns	28986175
							Resin in bulk	Capto Q	25 mL	N/A	up to 700 cm/h	0.3	1 bottle	17531610
									100 mL				1 bottle	17531602
			S	Strong cation	4 to 12	Lysozyme > 120 mg/mL resin	HiTrap column	HiTrap Capto S	1 mL	7 × 25	up to 1 mL/min	0.3	5 columns	17544122
									5 mL	16 × 25	up to 5 mL/min	0.3	5 columns	17544123
							HiScreen column	HiScreen Capto S	4.7 mL	7.7 × 100	2.3 mL/min	0.3	1 column	28926979
							PreDictor 96-well filter plates	PreDictor Capto S	2 µL	N/A	N/A	N/A	4 × 96-well filter plates	28925808
									20 µL				4 × 96-well filter plates	28925809
									50 µL				4 × 96-well filter plates	28925810
								PreDictor Capto S Isotherm	2, 4, 6, 8, 20 and 50 µL				4 × 96-well filter plates	28943279
							PreDictor RoboColumn	PreDictor RoboColumn Capto S	200 µL	N/A	N/A	N/A	row of 4 columns	28986081
									600 µL				row of 4 columns	28986176
							Resin in bulk	Capto S	25 mL	N/A	up to 700 cm/h	0.3	1 bottle	17544110
									100 mL				1 bottle	17544101
			DEAE	Weak anion	2 to 12	Ovalbumin > 90 mg/mL resin	HiTrap column	HiTrap Capto DEAE	1 mL	7 × 25	up to 1 mL/min	0.3	5 columns	28916537
									5 mL	16 × 25	up to 5 mL/min	0.3	5 columns	28916540
							HiScreen column	HiScreen Capto DEAE	4.7 mL	7.7 × 100	2.3 mL/min	0.3	1 column	28926982
							PreDictor 96-well filter plates	PreDictor Capto DEAE	2 µL	N/A	N/A	N/A	4 × 96-well filter plates	28925811
									20 µL				4 × 96-well filter plates	28925812
									50 µL				4 × 96-well filter plates	28925813
								PreDictor Capto DEAE Isotherm	2, 4, 6, 8, 20 and 50 µL				4 × 96-well filter plates	28943280
							PreDictor RoboColumn	PreDictor RoboColumn Capto DEAE	200 µL	N/A	N/A	N/A	row of 4 columns	28986082
									600 µL				row of 4 columns	28986177
							Resin in bulk	Capto DEAE	25 mL	N/A	up to 700 cm/h	0.3	1 bottle	17544310
									100 mL				1 bottle	17544301

** Median particle size of the cumulative volume distribution*

† *Capto HiRes replaces MonoBeads resin*

Ordering information

Resin	Main feature	Particle size, d_{50V}*	Ligand	Ion exchanger	pH (operational)	Examples of dynamic binding capacities	Column format	Product name	Volume	Column dimensions d × h (mm)	Recommended flow rates	Max pressure over packed bed (MPa)	Pack size	Product code
Sepharose Fast Flow (FF)	Easy scale-up. Broad choice of selectivity.	90 µm	Q	Strong anion	2 to 12	HSA 120 mg/mL resin	HiTrap column	HiTrap Q FF	1 mL	7 × 25	up to 1 mL/min	0.3	5 columns	17505301
									5 mL	16 × 25	up to 5 mL/min	0.3	5 columns	17515601
							HiScreen column	HiScreen Q FF	4.7 mL	7.7 × 100	2.3 mL/min	0.15	1 column	28950510
							HiPrep column	HiPrep Q FF 16/10	20 mL	16 × 100	2 to 10 mL/min	0.15	1 column	28936543
							Resin in bulk	Q Sepharose FF	25 mL	N/A	up to 700 cm/h	0.3	1 bottle	17051010
									300 mL				1 bottle	17051001
			SP	Strong cation	4 to 13	Ribonuclease 70 mg/mL resin	HiTrap column	HiTrap SP FF	1 mL	7 × 25	up to 1 mL/min	0.3	5 columns	17505401
									5 mL	16 × 25	up to 5 mL/min	0.3	5 columns	17515701
							HiScreen column	HiScreen SP FF	4.7 mL	7.7 × 100	2.3 mL/min	0.15	1 column	28950513
							HiPrep column	HiPrep SP FF 16/10	20 mL	16 × 100	2–10 mL/min	0.15	1 column	28936544
							Resin in bulk	SP Sepharose FF	25 mL	N/A	up to 700 cm/h	0.3	1 bottle	17072910
									300 mL	N/A	up to 700 cm/h	0.3	1 bottle	17072901
			DEAE	Weak anion	2 to 12	HSA 110 mg/mL resin	HiTrap column	HiTrap DEAE FF	1 mL	7 × 25	up to 1 mL/min	0.3	5 columns	17505501
									5 mL	16 × 25	up to 5 mL/min	0.3	5 columns	17515401
							HiScreen column	HiScreen DEAE FF	4.7 mL	7.7 × 100	2.3 mL/min	0.15	1 column	28978245
							HiPrep column	HiPrep DEAE FF 16/10	20 mL	16 × 100	2 to 10 mL/min	0.15	1 column	28936541
							Resin in bulk	DEAE Sepharose FF	25 mL	N/A	up to 700 cm/h	0.3	1 bottle	17070910
									500 mL				1 bottle	17070901
			ANX	Weak anion	3 to 13	BSA 43 mg/mL resin	HiTrap column	HiTrap ANX FF (high sub)	1 mL	7 × 25	up to 1 mL/min	0.3	5 columns	17516201
									5 mL	16 × 25	up to 5 mL/min	0.3	5 columns	17516301
							Resin in bulk	ANX Sepharose 4 FF (high sub)	25 mL	N/A	up to 700 cm/h	0.3	1 bottle	17128710
									500 mL				1 bottle	17128701
			CM	Weak cation	4 to 13	Ribonuclease 50 mg/mL resin	HiTrap column	HiTrap CM FF	1 mL	7 × 25	up to 1 mL/min	0.3	5 columns	17505601
									5 mL	16 × 25	up to 5 mL/min	0.3	5 columns	17515501
							HiPrep column	HiPrep CM FF 16/10	20 mL	16 × 100	2 to 10 mL/min	0.15	1 column	28936542
							Resin in bulk	CM Sepharose FF	25 mL	N/A	up to 700 cm/h	0.3	1 bottle	17071910
									500 mL				1 bottle	17071901

** Median particle size of the cumulative volume distribution*

† Capto HiRes replaces MonoBeads resin

Resin	Main feature	Particle size, d_{50V}*	Ligand	Ion exchanger	pH (operational)	Examples of dynamic binding capacities	Column format	Product name	Volume	Column dimensions d × h (mm)	Recommended flow rates	Max pressure over packed bed (MPa)	Pack size	Product code
Selection kits														
Sepharose FF	Use to screen the different IEX ligands for best fit with your protein	90	†	†	†	†	HiTrap Selection Kit	HiTrap IEX Selection Kit	1 mL	7 × 25	up to 1 mL/min	0.3	7 columns	17600233
Capto	Use to screen the different IEX and Multimodal ligands to find the fit with your protein	90	‡	‡	‡	‡	HiTrap Selection Kit	HiTrap Capto IEX Selection Kit	1 mL	7 × 25	up to 1 mL/min	0.3	5 columns	28934388
PreDictor Screening Plates														
AIEX resins screening	Use these plates to screen different anion resins		§	§	§	§	PreDictor screening kit	PreDictor AIEX Screening	2 µL/ 6 µL	N/A	N/A	N/A	4 × 96-well filter plates	28943288
									20 µL	N/A	N/A	N/A	4 × 96-well filter plates	28943289
CIEX resins screening	Use these plates to screen different cation resins		¶	¶	¶	¶	PreDictor screening kit	PreDictor CIEX Screening	2 µL/ 6 µL	N/A	N/A	N/A	4 × 96-well filter plates	28943290
									20 µL	N/A	N/A	N/A	4 × 96-well filter plates	28943291
Capto AIEX polishing resins screening	Use these plates to screen different anion exchangers specifically for polishing step		**	**	**	**	PreDictor screening kit	PreDictor Capto AIEX Polishing Screening	2 µL/ 6 µL	N/A	N/A	N/A	4 × 96-well filter plates	29095570
									20 µL	N/A	N/A	N/A	4 × 96-well filter plates	29095569
Capto CIEX polishing resins screening	Use these plates to screen different cation exchangers specifically for polishing step		††	††	††	††	PreDictor screening kit	PreDictor Capto CIEX Polishing Screening	2 µL/ 6 µL	N/A	N/A	N/A	4 × 96-well filter plates	29095568
									20 µL	N/A	N/A	N/A	4 × 96-well filter plates	29095567

* *Median particle size of the cumulative volume distribution*

† *HiTrap IEX Selection Kit includes: HiTrap Q FF 1 mL, HiTrap SP FF 1 mL, HiTrap DEAE FF 1mL, HiTrap CM FF 1 mL, HiTrap ANX FF (high sub) 1 mL, HiTrap Q XL 1 mL, and HITrap SP XL 1 mL*

‡ *HiTrap Capto IEX Selection Kit includes: HiTrap Capto Q 1mL, HiTrap Capto S 1 mL, HiTrap Capto DEAE 1 mL, HiTrap Capto MMC 1 mL, and HiTrap Capto adhere 1 mL*

§ *PreDictor AIEX screening plate 2 µL/6 µL contains: Capto Q 2 µL, Capto DEAE 2 µL, Q Sepharose Fast Flow 6 µL and Capto adhere 6 µL. The 20 µL screening plate contains: 20 µL per well of the corresponding resin.*

¶ *PreDictor CIEX screening plate 2µL/6µL contains: Capto S 2 µL, SP Sepharose Fast Flow 6 µL and Capto MMC 6 µL. The 20 µL screening plate contains: 20 µL per well of the corresponding resin.*

** *PreDictor Capto AIEX polishing screening plate 2 µL/6 µL contains: Capto Q 2 µL, Capto Q ImpRes 6 µL, Capto adhere 6 µL and Capto adhere ImpRes 6 µL. The 20 µL screening plate contains: 20 µL per well of the corresponding resin.*

†† *PreDictor Capto CIEX polishing screening plate 2 µL/6 µL contains : Capto S ImpAct 2 µL, Capto SP ImpRes 6 µL and Capto MMC ImpRes 6 µL. The 20 µL screening plate contains: 20 µL per well of the corresponding resin.*

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