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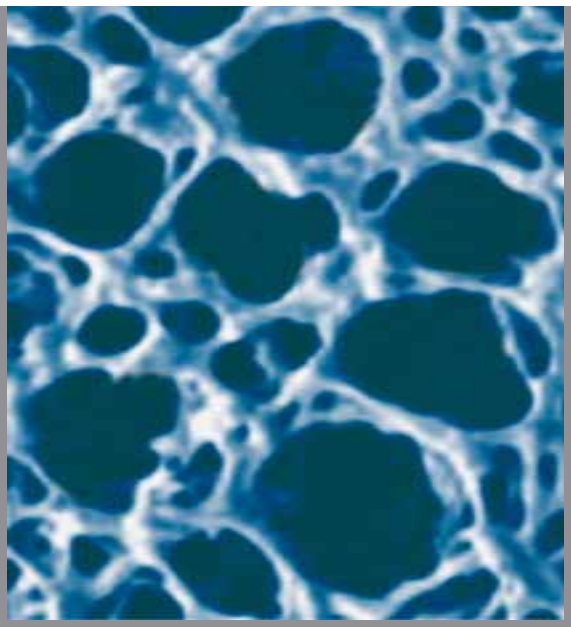
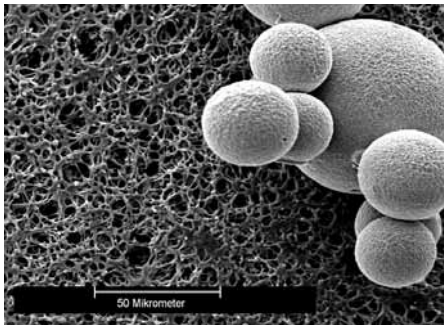
VIVASCIENCE TECHNOLOGY



Vivapure®
Ion Exchange Spin Columns

Vivapure®
Ion Exchange Protein Purification Products



Chromatography gel beads (right) are shown on top of a membrane adsorber in this SEM picture. The membrane adsorber pores are over 50 × larger than bead pores.

Fast and easy-to-use spin columns
Vivapure Ion Exchange (IEX) spin columns are centrifugal devices, incorporating Sartobind Membrane Adsorber technology as their chromatography matrix. Vivapure IEX spin columns make protein purification as easy as filtration. The devices are ready-to-use and do not bear the risk of running dry. For many protein purification applications, they can replace time-consuming and tedious column chromatography.

The rapid 1-2-3 bind-wash-elute protocol especially lends itself to screening applications, where many different samples are processed in parallel.

The Sartobind membrane adsorber matrix
Sartobind IEX membrane adsorbers are based on stabilized regenerated cellulose and display a microporous structure with a pore size of > 3 µm, which is orders of magnitude larger than conventional chromatographic gel materials. This allows molecules to be transported to the ligands immobilized on the membrane adsorber by convective flow, leading to very high flow rates.

In contrast to that, gel chromatography is slowed down due to diffusion limitations, as the molecules need to enter the small bead pores in order to be bound by the ligands. The porous membrane adsorber enables fast, reproducible and scalable protein purification.

Vivawell 96-well plate-800 µl
Binding capacity: 200 µg

Available formats

Vivapure® IEX Products	Application
Vivawell 96-well plates	– High throughput applications – Contaminant (e.g. DNA and endotoxin) removal
Vivawell 8-strip plates	– High throughput application, where larger capacities are needed (e.g. high throughput applications for Vivapure Mini)
Vivapure Mini Spin Columns	– Sample fractionation – Purification condition scouting – Small scale purification
Vivapure Maxi Spin Columns	– Large scale sample fractionation – One step protein purification| concentration – Polishing of his-tagged protein

Vivawell 8-strip plate-300 µl
Binding capacity: 1 mg

Membrane availability

Functional groups	Ion exchanger type	
Sulphonic acid (S)	Strong acidic cation exchanger:	$R\text{-}CH_2\text{-}SO_3^-Na^+$
Quaternary ammonium (Q)	Strong basic anion exchanger:	$R\text{-}CH_2\text{-}N^+\text{-}(CH_3)_3Cl^-$
Carboxylic acid (C)	Weak acidic cation exchanger:	$R\text{-}COO^-$
Diethylamine (D)	Weak basic anion exchanger:	$R\text{-}CH_2\text{-}NH^+\text{-}(CH_2H_5)_2$

Vivapure IEX advantages

Vivapure Mini-400|500 µl
Binding capacitis: 1–4 mg

Vivapure Maxi-19|20 ml
Binding capacitis: 15–80 mg

Fast and simple to use spin columns
- Devices are ready to use
- Make protein purification as simple as filtration

Reproducible results
- No column packing necessary – devices are ready to use
- Membrane adsorber spin columns cannot crack or run dry

Centrifugal devices
- Offer the possibility of working in parallel

Low bed volume
- Small membrane adsorber bed volumes allow working with lower buffer amounts, leading in concentrated elution fractions

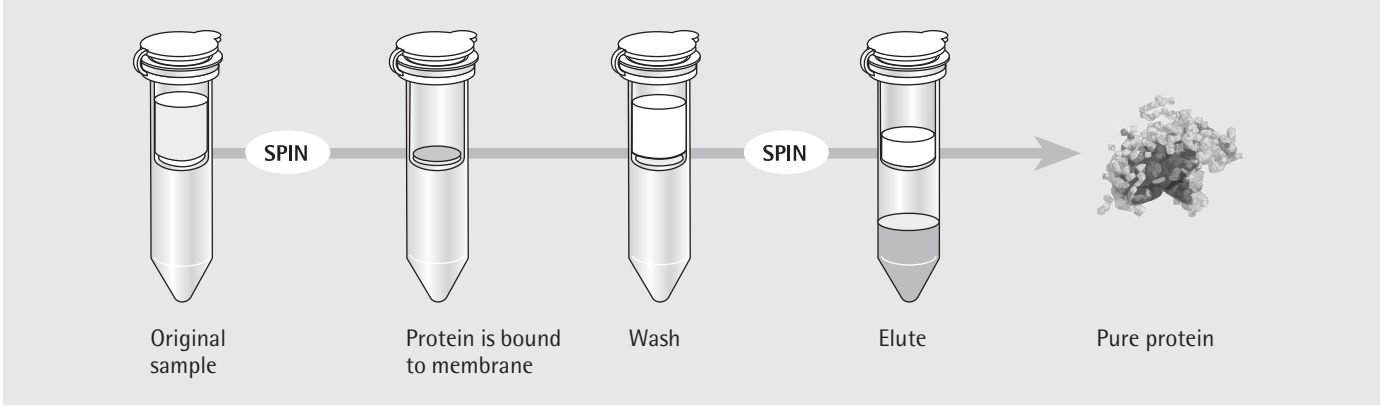
Up-scalable product range
- Process scale modules are available with the same Sartobind IEX membrane adsorber matrix

Typical Applications
- Fractionation prior to further analysis e.g. 2D gels
- Scouting purification conditions for new protein preparation protocols
- Endotoxin removal
- Polishing His-tagged proteins after metal chelate chromatography
- Purification and concentration of proteins
- Removal of heme moiety from heme containing proteins

Detailed application notes are available on our website: www.sartorius.com

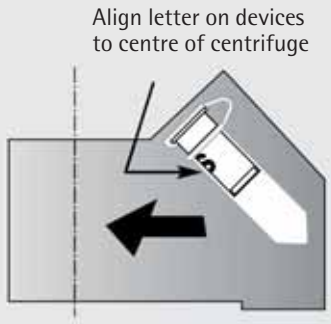
Scalable to industrial scale applications
Sartobind membrane adsorber (MA) technology is available from 96-well plate format to industrial process scale modules. Sartobind IEX MA units are useful tools when flow control is needed, as the down scale step to a process scale application.

Sartobind Q 75MA unit may be used manually with a syringe or with a chromatographic system via luer lock adapters. For technical data and description, ask for Sartobind Membrane Adsorber information.



Fast and easy protein purification with Vivapure spin columns

Technical Specifications



Orientation of Vivapure spin columns in a fixed-angle rotor
To achieve optimal performance of Vivapure spin columns in a fixed-angle rotor, we recommend aligning the printed character (e.g. Q, D, S or C) on the insert towards the centre of the rotor for the binding, washing and elution steps. This measure garantees even liquid flow through the membrane during all chromatography steps.

Required Equipment

Vivawell 96-well plates and 8-strip plates
Bench-top centrifuge with swing out rotor that can accommodate deep well multiwell plates.

Vivapure Mini spin columns
Microfuge with 45° fixed angle rotor that can accommodate 2.2 ml micro-centifuge tubes. Vivapure Mini spin columns need to be orientated correctly in a fixed-angle rotor.

Vivapure Maxi spin columns
Ideally, a bench-top centrifuge with swing out rotor that can accommodate 50 ml centrifuge tubes. Vivapure Maxi spin columns need to be orientated correctly in a fixed-angle rotor.

Capacities and dimensions

Device	Bed Volume (µl)	Membrane Area (cm^2)
Vivawell 96-well plate	20	0.6
Vivawell 8-strip	80	2.4
Vivapure Mini M	60	1.87
Vivapure Mini H	240	7.48
Vivapure Maxi M	670	21.10
Vivapure Maxi H	2700	84.40

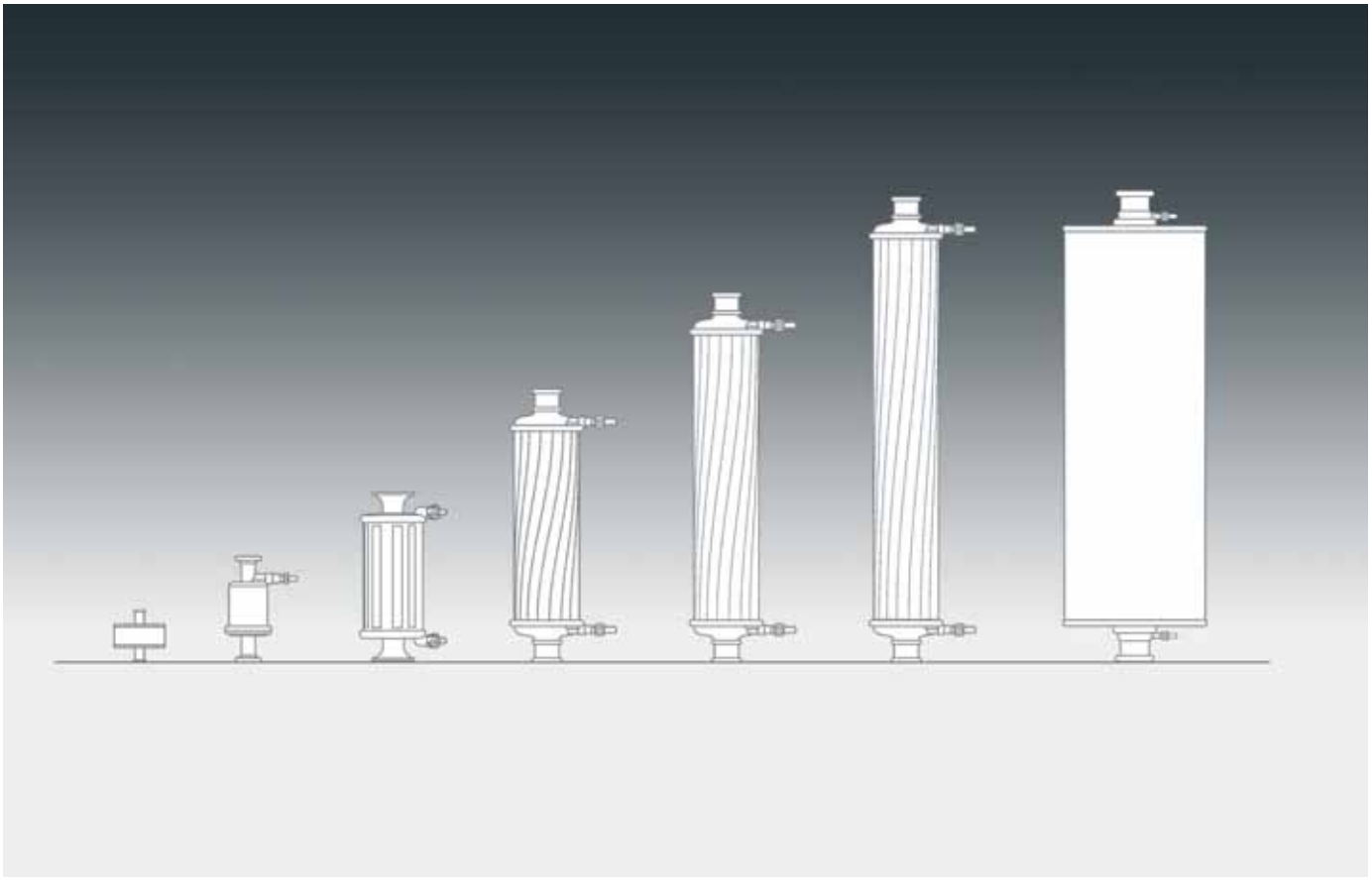
Membrane Adsorber	
Nominal pore size	3–5 µm (Large pore size prevents gel filtration effects and minimizes non-specific adsorption)
Thickness	230–320 µm
Amount of ionic groups (µEquivalents/ml)	145–218 µEquivalents/ml for monovalent ions (D,Q & S) 72 µEquivalents/ml for monovalent ions (C)
Working pH (D & C)	4–10
Working pH (Q & S)	2–12
Approximate pka of ionic groups	D–9.5 | Q–11 | S–1 | C–4.5

Materials of construction	
Device	Polypropylene
Supporting matrix	Stabilized regenerated cellulose

Typical Performance

Vivapure spin columns	Protein binding capacity* (mg)	Max. volume per centrifuge run using a swing-out rotor (ml)	Max. volume per centrifuge using a fixed angle rotor run (ml)
Vivawell 96-well plate	0.2	0.8	
Vivawell 8-strip	1	0.3	
Vivapure Mini M	1	0.5	
Vivapure Mini H	4	0.4	
Vivapure Maxi M	15–20	20	10.5
Vivapure Maxi H	60–80	19	10.5

* Actual yields depend on specific protein sample and selected pH and salt conditions. Yields established using 1 mg/ml BSA in 25 mM Tris/HCL pH 8.0 with Vivapure Q & D spin columns and 1 mg/ml cytochrome c in 25 mM sodium acetate buffer pH 5.5 with Vivapure S & C spin columns.



Scalable SingleSep disopsable capsules for process scale applications, e.g. virus removal, DNA removal and endotoxin removal. The devices are available in formats ranging from 1 ml to 1620 l membrane volume, for capacities from 0.029 g to 48 g. For technical data and description, refer for SingleSep brochures and datasheets.

Vivapure IEX spin columns – Applications

1. Fractionation of complex protein lysates with IEX-membrane spin columns improves resolution of 2-D PAGE.

   Perkin Elmer, Boston (USA) Mary Lopez et al., American Biotechnology|Laboratory

2. A fast and simple protocol for finding out the optimal purification conditions (purification scouting) of an unknown protein, using different buffers and IEX spin column chemistries in parallel.

   Vivascience, Hanover, Germany C. Neumann et. Al.

3. A simple, fast and reliable method using Vivapure Q Mini for removing highly charged contaminant from samples prior to 2D-PAGE e.g. proteoglycanes from cartilage explant.

   Roche, Palo Alto, USA

4. Vivapure centrifugal anion exchangers were used to remove endotoxin from research grade monoclonal antibody solutions easily with high protein recovery.

   Cambridge Antibody Technology, Cambridge UK B. Fish et al., Drug Discovery 3 (2003) 26-27

5. A simple and reliable protocol for the separation of Tween 20 treated soluble Guanylate cyclase from detergent and free porphyrin is described using Vivapure Mini Q for routine use.

   Bayer Ag Wuppertal, Germany P. Schmidt et al., Protein Expression and Purification 31 (2003) 42-46

6. Application of Vivapure S centrifugal ion-exchange membrane devices for the purification|polishing of Histagged proteins for crystallization.

   Birkbeck College, University of London, UK.

7. Purification of caspase-14 using Vivapure Mini H D anion exchange spin columns for functional analysis.

   Department of Medicine, University of Washington, Seattle, USA Andy J. Chien et al., Biochem. And Biophys. Research Communications 296 (2002) 911-9177.

8. Rapid removal of the detergent, n-octyl beta-D-glucopyranoside from a membrane protein mimic using an innovative centrifugal anion exchange membrane technology.

   University of Cambridge, UK.

9. Purification of monoclonal antibodies from high cell density (MiniPERM) tissue culture supernatant using Vivapure centrifugal ion exchange membrane devices.

   University of Bochum, Germany.

Available in detail on our website: www.sartorius.com

Applications
Fractionation of protein mixtures prior to 2D-PAGE
Purification scouting of an unknown protein
Sample preparation prior to 1-D or 2-D PAGE
Removal of endotoxins from monoclonal antibodies
Preparation of heme moiety from heme containing protein for functional analysis
Polishing of His-tagged proteins
General protein purification
Detergent removal from protein solutions
Purification of antibodies from serum, ascites or tissue culture supernatant
Establishing a purification/prepurification protocol for a given protein
HPLC/FPLC sample preparation
Purification of membrane-bound proteins

Ordering Information

Cat Number	Vivawell Plates	Pack size
VW-96IQ02	Vivawell-96 Q-IEX plate	2
VW-96IS02	Vivawell-96 S-IEX plate	2
VW-96ID02	Vivawell-96 D-IEX plate	2
VW-96IC02	Vivawell-96 C-IEX plate	2
VW-08IQ02	Vivawell 8-strip Q-IEX plate	24
VW-08IS02	Vivawell 8-strip S-IEX plate	24
VW-08ID02	Vivawell 8-strip D-IEX plate	24
VW-08IC02	Vivawell 8-strip C-IEX plate	24

Cat Number	Vivapure Mini Spin Columns	Spin Centrifuge	Columns Tubes
VS-IX01ST16	Vivapure Mini H Starter Kit (4 of each ion exchange class)	16	32
VS-IX01CM24	Vivapure C Mini M	24	48
VS-IX01CH24	Vivapure C Mini H	24	48
VS-IX01DM24	Vivapure D Mini M	24	48
VS-IX01DH24	Vivapure D Mini H	24	48
VS-IX01QM24	Vivapure Q Mini M	24	48
VS-IX01QH24	Vivapure Q Mini H	24	48
VS-IX01SM24	Vivapure S Mini M	24	48
VS-IX01SH24	Vivapure S Mini H	24	48

Cat Number	Vivapure Maxi Spin Columns	Spin Centrifuge	Columns Tubes
VS-IX20CH08	Vivapure C Maxi H	8	16
VS-IX20DH08	Vivapure D Maxi H	8	16
VS-IX20QM08	Vivapure Q Maxi M	8	16
VS-IX20QH08	Vivapure Q Maxi H	8	16
VS-IX20SM08	Vivapure S Maxi M	8	16
VS-IX20SH08	Vivapure S Maxi H	8	16

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