Laboratory Ultrafiltration: Product Qualification Guide

How to choose the best device for each lab ultrafiltration application

The guide below is designed to help ultrafiltration process developers, researchers, lab managers and any other end users, select the best Sartorius product range for their application. It focuses on the three critical aspects of selection: target type, target size and sample volume, whilst also highlighting what product range may be suitable for typical sample treatment and control processes, such as for sensitive samples and how to define a final concentrate volume.

Some examples are also provided. It should be noted that this guide is based upon typical ultrafiltration models. Due to the variations within protein, membrane and inorganic chemistry, etc., we always recommend testing with sample devices prior to establishing a method.

How to use this guide:

Sample Parameter

Membrane | MCWO | Method | Product | Application

Typical Recommendation

Sample Volume

Treatment and Control

Protein (neutral or negatively charged)

Membranes:

Vertical Membrane ■ PES, RC and CTA

Products Available:

Vivaspin® 500, Vivaspin® 2, 6 & 20, Vivaspin® Turbo 4 & 15 PES, Vivacell® 100, Vivaflow® 50 & 200

Protein (positively charged)

Membranes: Vertical Membrane

■ Hydrosart® and RC

Products Available:

Vivaspin® 2, Vivaspin® Turbo 15 RC, Vivaflow® 50R & 200, Vivacon® 500 & 2, Centrisart®

Virus

Membranes: Vertical Membrane

■ Hydrosart®, PES and RC **Products Available:**

Vivaspin® 500, Vivaspin® 2, 6 & 20, Vivaspin® Turbo 4 & 15 PES & RC, Vivacell® 100, Vivaflow® 50, 50R & 200

Extracellular Vesicles

Membranes:

Vertical Membrane

■ Hydrosart®, PES and RC **Products Available:**

Vivaspin® 500, Vivaspin® 2, 6 & 20, Vivaspin® Turbo 4 & 15 PES & RC, Vivacell® 100, Vivaflow® 50, 50R & 200

Inorganics

Membranes:

Vertical Membrane ■ Hydrosart®, PES and RC

Products Available: Vivaspin® 500, Vivaspin® 2, 6 & 20, Vivaspin® Turbo 4 & 15 PES &

RC, Vivacell® 100, Vivaflow® 50

<10 kDa

MCWOs:

2K, 3K **Products Available:**

Vivaspin® 500, 2, 6, 15R, 20, Vivaspin® Turbo PES 4 & 15, Vivaflow® 50 & 200, Vivacon® 500 & 2, Vivapore® 5, 10 | 20

10-30 kDa

MCWOs: 3K, 5K

Products Available:

Vivaspin® 500, 2, 6, 15R, 20, Vivaspin® Turbo 4 & 15 PES & RC, Vivacell, Vivaflow® 50, 50R & 200, Centrisart®, Vivacon® 500 & 2

30-150 kDa

MCWOs:

7.5K, 10K, 30K, 50K **Products Available:**

Vivaspin® 500, 2, 6, 15R, 20, Vivaspin® Turbo 4 & 15 PES & RC, Vivacell, Vivaflow® 50, 50R & 200, Centrisart®, Vivapore®, Vivacon® 500 & 2

150-500 kDa

MCWOs:

50K, 100K, 125K

Products Available: Vivaspin[®] 500, 2, 6, 15R, 20,

Vivaspin® Turbo 4 & 15 PES & RC, Vivacell, Vivaflow® 50, 50R & 200. Centrisart®, Vivacon® 500 & 2

500-1000 kDa

DNAIRNA

Membranes:

Horizontal Membrane

Hydrosart® and CTA

Centrisart®, Vivacon® 500 & 2

Products Available:

MCWOs:

100K, 125K, 300K **Products Available:**

Vivaspin® 500, 2, 6 & 20, Vivaspin® Turbo 4 & 15 PES & RC, Vivacell, Vivaflow® 50, 50R & 200, Centrisart®, Vivacon® 500 & 2

>1000 kDa

MCWOs:

& 200

300K, 1,000K, 0.2 um

Products Available: Vivaspin® 500, 2, 6 & 20.

Vivacell, Vivaflow® 50 & 200. Centrisart®, Vivacon® 500 & 2

0.1-2.5 mL



Ultrafiltration Method:

Centrifugal

Products Available:

Vivaspin® 500 & 2, Vivacon® 500 & 2, Centrisart®

2.5-20 mL



Ultrafiltration Method:

Centrifugal, pressurization, static

Products Available:

Vivaspin® 6, 15R & 20, Vivaspin® Turbo 4 & 15 PES & RC, Centrisart®,

20-100 mL



Ultrafiltration Method: Centrifugal, pressurization **Products Available:** Vivacell 100

50-5000 mL



Ultrafiltration Method: Tangential flow filtration (TFF) Products Available: Vivaflow® 50, 50R & 200

Buffer Exchange

Key Points:

To maintain buffer balance, de-salt, prevent precipitation, to replace with different buffer. Diafiltration allows for simultaneous buffer exchange and concentration

Process Available:

Diafiltration cup with **Vivaspin®** 20, diafiltration reservoir with Vivaflow® 50, 50R & 200.

Application Note: <a>

Low Concentrations

Key Points:

Samples with low concentrations rely on near 100% recovery, preventing non-specific absorption is key for this **Process Available:**

Passivation through rinsing with non interfering protein and buffer solutions (e.g. BSA, Tween 20, SDS). Available with all products.

Application Note: <a> I

Depyrogenation

Key Points:

Removal of endotoxins (lipopolysaccharides) from concentrate samples, may utilise an NaOH addition step.

Process Available:

NaOH treatment followed by washes, concentration and buffer exchange. Available in products resistant to NaOH; Vivaspin® Turbo 4 & 15 PES & RC, Vivaflow® 50R & 200

Application Note: <a>

Device Sanitization

Key Points:

Reduction of bioburden and contaminating microbes. Level of reduction to be determined by user testing.

Process Available:

Pre-rinse with 70% ethanol or Sanitization through EtO gas treatment. Available to all products excluding Vivacell and Vivaflow (separate cleaning processes)

Application Note: TBA

Key Points:

Varying speeds of concentration make it hard to judge time to reach a final volume.

Final Volume

Process Available:

Pre-filling the filtrate tube limits the volume of concentration, thereby define the final concentrated volume. Available to all centrifugal concentration products.

Application Note:

*For conversion from diameter, base pair length, other other dimensions to equivalent Molecular Weight please refer

Sensitive Samples

Key Points: Changing transmembrane

pressures can incur shear stress and degrade sensitive biomolecule targets.

Process Available:

Pressurization and TFF ultrafiltration methods give stable transmembrane pressure and flux compared to centrifugal. Available in **Vivacell** & Vivaflow® products

Application Note: TBA

1. Monoclonal Antibodies

Application: Concentration for purification Target Type: IgG1, IgG2a, IgG2b, IgG3

Target Size: 150 kDa Sample Volume: 3 L

Product Used: 30K PES Vivaflow® 200

Treatment and Control Processes: Prerinsing with 2 L DI water to remove storage buffer and to perform integrity check.

Result: 98% concentration recovery from 3 L Hybridoma cell culture supernatant at 20-25 mL/ min (two hours), concentrating 10 fold from 30 mg/L to > 300 mg/L

2. Bence Jones Protein

Application: Concentration for urine protein electrophoresis and sample diagnosis Target Type: Monoclonal FLC (BJP)

Target Size: 20 - 25 kDa Sample Volume: 10 mL **Product Used:** 10K PES Vivaspin® 20 Treatment

de-salting

Results: a 92% recovery with 200 fold conc. factor in ~45 minutes, providing sufficient concentration to show clear visible bands results from UPE and capillary electrophoresis

and Control Processes: Buffer exchange for sample

3. Lentivirus

Application: Polishing after AEX chromatography

Target Type: Lentivirus viral vector Target Size: ~100 nm

Sample Volume: 20 mL Product Used: IVD 100K PES Vivaspin® 20 Treatment and Control Processes: Desalting in parallel concentration with diafiltration cup

Results: 78 – 143 fold concentrations of 20 mL samples within 34-40 minutes, increasing particle numbers from 6.1×10⁷ to 3.0×10⁹ recovery after purification.

to the Sartorius Lab Ultrafiltration Selection Guide

4. DNA PCR Primers

Application: Conc. of target primers and removal of

interfering short bp primers Target Type: dsDNA Target Size: 300 bp Sample Volume: 1800 uL Product Used: 30K Vivacon® 2

Treatment and Control Processes: Results: Near total removal (>95%) of primer DNA and near total retention of 300 bp molecules, within a 20 minute spin time and a total 40 minute procedure time

Example Applications