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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

Target Type

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

DNA | RNA

Membranes:
Horizontal Membrane
- Hydrosart® and CTA

Products Available:
Centrisart®, Vivacon® 500 & 2

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 & 200

Target Size*

<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

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:
300K, 1,000K, 0.2 um
Products Available:
Vivaspin® 500, 2, 6 & 20, Vivacell, Vivaflow® 50 & 200, Centrisart®, Vivacon® 500 & 2

Sample Volume

0.1 – 2.5 mL

Ultrafiltration Method:
Centrifugal
Products Available:
Vivaspin® 500 & 2, Vivacon® 500 & 2, Centrisart®

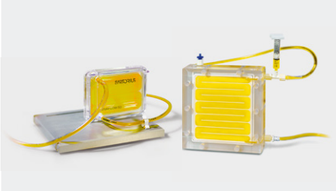
2.5 – 20 mL

Ultrafiltration Method:
Centrifugal, pressurization, static
Products Available:
Vivaspin® 6, 15R & 20, Vivaspin® Turbo 4 & 15 PES & RC, Centrisart®, Vivapore®

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

Treatment and Control

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: ☑

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: ☑

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: ☑

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

Final Volume

Key Points:
Varying speeds of concentration make it hard to judge time to reach a 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: ☑

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

Example Applications

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 and Control Processes: Buffer exchange for sample 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

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 6.1×10^7 to 3.0×10^9 recovery after purification.

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

Find further details of all tips, tricks, applications and products by contacting your local Sartorius representative.
www.sartorius.com

*For conversion from diameter, base pair length, other other dimensions to equivalent Molecular Weight please refer to the Sartorius Lab Ultrafiltration Selection Guide