Spin-X® UF Concentrator Product Selection Guide

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Introduction

Spin-X® UF concentrators are disposable, single-use only ultrafiltration devices with polyethersulfone (PES) membranes for the centrifugal concentration and/or purification of biological samples. This guide will help you choose the best Spin-X UF concentrator for your application.

Major Uses for Ultrafiltration

Ultrafiltration is a convective process that uses anisotropic semi-permeable membranes to separate macromolecular species and solvents primarily on the basis of size. It is particularly appropriate for the concentration of macromolecules and can also be used to purify molecular species or for solvent exchange (Table 1). Ultrafiltration is a gentle, non-denaturing method that is more efficient and flexible than alternative processes.

Solute Concentration

Ultrafiltration membranes are used to increase the solute concentration of a desired biological species. The filtrate is cleared of macromolecules which are significantly larger than the retentive membrane pores. Microsolute is removed convectively with the solvent.

Solute Desalting or Purification

A solution may be purified from salts, non-aqueous solvents, and generally from low molecular weight materials. Multiple solvent exchanges will progressively purify macromolecules from contaminating solutes. Microsolutes are removed most efficiently by adding solvent to the solution being ultrafiltered at a rate equal to the speed of filtration. This is called diafiltration.

Table 1. Typical Ultrafiltration Applications

General purpose laboratory concentration and desalting of proteins, enzymes, cells, biomolecules, antibodies, and immunoglobulins
Removal of labeled amino acids and nucleotides
HPLC sample preparation
Deproteinization of samples
Recovery of biomolecules from cell culture supernatants, lysates

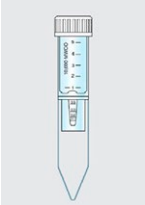
Choosing the Right Concentrator

Corning offers Spin-X UF concentrators in three sizes. The information below and Tables 2 and 3 will help you find the best concentrator for your needs.

1. Spin-X UF 500 for 100 to 500 µL samples

Spin-X UF 500 µL concentrators offer a simple, one-step procedure for sample preparation. They can effectively be used in fixed angle rotors accepting 2.2 mL centrifuge tubes.

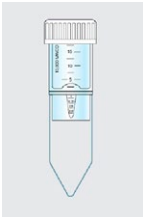
The vertical membrane design and thin channel filtration chamber minimizes membrane fouling and provides high speed concentrations, even with particle laden solutions.



2. Spin-X UF 6 for 2 to 6 mL samples

Spin-X UF 6 mL concentrators offer increased volume flexibility and performance. Spin-X UF 6 concentrators can process up to 6 mL in swing bucket or fixed angle rotors accepting standard 15 mL conical bottom tubes. In a single spin, solutions can be concentrated in excess of 100-fold. Samples are typically concentrated in 10 to 30 minutes with macromolecular recoveries in excess of 95%.

The Spin-X UF 6 features twin vertical membranes for unparalleled filtration speeds and 100X plus concentrations. Remaining volume is easy to read off the printed scale on the side of the concentrator, and the modified dead stop pocket further simplifies direct pipet recovery of the final concentrate.



3. Spin-X® UF 20 for 5 to 20 mL samples

Spin-X UF 20 mL concentrators offer increased volume flexibility and performance. Spin-X UF 20 handles up to 20 mL in swing bucket centrifuges and 14 mL in 25˚ fixed angle rotors accepting 50 mL centrifuge tubes.

Featuring twin vertical membranes for unparalleled filtration speeds, the Spin-X UF 20 can achieve 100X plus concentrations. The remaining volume is easy to read off the printed scale on the side of the concentrator, and the modified dead stop pocket further simplifies direct pipet recovery of the final concentrate.

Table 2. Technical Properties of Spin-X UF Concentrators

Concentrator	Spin-X UF 500	Spin-X UF 6	Spin-X UF 20
Concentrator Capacity			
Swing bucket rotor	Do not use	6 mL	20 mL
Fixed angle rotor	500 µL	6 mL	14 mL
Minimum rotor angle	40°	25°	25°
Dimensions			
Total Length	50 mm	122 mm	116 mm
Width	11 mm	17 mm	30 mm
Active membrane area	0.5 cm^2	2.5 cm^2	6.0 cm^2
Membrane hold up volume	<5 µL	<10 µL	<20 µL
Dead stop volume*	5 µL	30 µL	50 µL
Materials of Construction			
Body	Polycarbonate	Polycarbonate	Polycarbonate
Filtrate vessel	Polypropylene	Polycarbonate	Polycarbonate
Concentrator cap	Polycarbonate	Polypropylene	Polypropylene
Membrane	Polyethersulfone	Polyethersulfone	Polyethersulfone

*Dead stop volume as designed in molding tool. This volume may vary depending on sample, sample concentration, operation temperature, and centrifuge rotor.

Choosing the Best Molecular Weight Cut-off (MWCO) Membrane

Spin-X UF concentrators use general purpose polyethersulfone membranes that provide excellent performance with most solutions when retentate recovery is of primary importance. Polyethersulfone membranes exhibit no hydrophobic or hydrophilic interactions and are usually preferred for their low fouling characteristics, exceptional flux, and broad pH range.

Table 3. PES Membrane Selection Guide (recommended MWCO*)

Application	<5,000	10,000	30,000	50,000	100,000
Bacteria					■
Enzymes	■	■			
Growth factors	■	■			
Immunoglobulins			■	■	■
MAB			■	■	■
Peptides	■		■	■	
Virus			■	■	■
Yeast					■

*For highest recovery, select a membrane MWCO which is at least half of the molecular weight of the solute to be retained.

The advanced designs and low adsorption materials that characterize Spin-X® UF products offer a unique combination of faster processing speeds and higher recovery of the concentrated sample. Providing that the appropriate device size (Table 2) and membrane cut-off (Table 3) are selected, Spin-X UF products will typically yield recoveries of the concentrated sample in excess of 90% when the starting sample contains over 0.1 mg/mL of the solute of interest (Table 4). Most of the loss is caused by nonspecific binding both to the membrane surface and to exposed binding sites on the plastic of the sample container.

Table 4. Spin-X UF Concentrators Performance Characteristics
(Time in minutes to concentrate up to 30X at 20°C and solute recovery %)

Concentrator	Spin-X UF 500		Spin-X UF 6				Spin-X UF 20			
Rotor	40° Fixed Angle		Swing Bucket		25° Fixed Angle		Swing Bucket		25° Fixed Angle	
Start volume	500 µL		6 mL		6 mL		20 mL		14 mL	
	Min.	Rec.	Min.	Rec.	Min.	Rec.	Min.	Rec.	Min.	Rec.
BSA 1.0 mg/mL (66,000 MW)										
5,000 MWCO PES	15	96%	20	98%	12	98%	23	99%	29	99%
10,000 MWCO PES	5	96%	13	98%	10	98%	16	98%	17	98%
30,000 MWCO PES	5	96%	12	98%	9	97%	13	98%	15	98%
IgG 0.25 mg/mL (160,000 MW)										
30,000 MWCO PES	10	96%	18	96%	15	95%	27	97%	20	95%
50,000 MWCO PES	10	96%	17	96%	14	95%	27	96%	22	95%
100,000 MWCO PES	10	96%	15	91%	12	91%	25	91%	20	90%

Adsorption to the Membrane

Depending on sample characteristics relative to the membrane type used, solute adsorption on the membrane surface is typically 2 to 10 µg/cm^2. This can increase to 20 to 100 µg/cm^2 when the filtrate is of interest and the solute must pass through the whole internal structure of the membrane. Typically, a higher cut-off membrane will bind more than a low molecular weight cut-off membrane.

Adsorption to the Sample Container

Although every effort is made to minimize this phenomenon by the selection of low adsorption materials and tool production to optical standards, some solute will bind to the internal surface of the sample container. While the relative adsorption will be proportionately less important on the sample container than on the membrane, due to the higher total surface area, this can be the major source of yield loss.

Helpful Hints

Flow Rate

Flow rate is affected by several parameters, including MWCO, porosity, sample concentration, viscosity, centrifugal force, and temperature. Expect significantly longer spin times for starting solutions with over 5% solids. When operating at 4°C, flow rates are approximately 1.5 times slower than at 25°C. Viscous solutions such as 50% glycerin will take up to 5 times longer to concentrate than samples in a predominantly buffer solution.

Prerinsing

Membranes fitted to Spin-X® UF concentrators contain trace amounts of glycerin and sodium azide. Should these interfere with analysis, they can be removed by rinsing fill volume of buffer solution or deionized water through the concentrator. Decant filtrate and concentrate before processing sample solution. If you do not want to use the prerinsed device immediately, store it in the refrigerator with buffer or water covering the membrane surface. Do not allow the membrane to dry out.

Sterilization of Polyethersulfone Membranes

Polyethersulfone membranes should not be autoclaved as high temperatures will substantially increase membrane MWCO. To sanitize or sterilize these devices, use a 70% ethanol solution or sterilizing gas mixture.

Optimizing Solute Recovery

When highest solute recoveries are most important, in particular when working with solute quantities in the microgram range, Corning recommends considering the following key points:

- Select the smallest device that suits the sample volume. Additionally, take advantage of the extra speed of Spin-X UF concentrators by refilling a smaller concentrator repeatedly.
- Select the lowest MWCO membrane that suits the application.
- When available, use swing bucket rotors rather than fixed angle rotors. This reduces the surface area of the concentrator that will be exposed to the solution during centrifugation.
- Reduce centrifugal force to approximately half of the maximum recommended (Table 5).
- Avoid over-concentration. The smaller the final concentrate volume, the more difficult it is to achieve complete recovery. If feasible, after a first recovery, rinse the device with one or more drops of buffer and then recover again.
- Pre-treat the device overnight with a passivation solution such as 5% SDS, TWEEN® 20, or Triton™ X in distilled water. Then, rinse thoroughly before use.

Table 5. Maximum Recommended Centrifugal Force

Concentrator	Spin-X UF 500	Spin-X UF 6	Spin-X UF 20
Maximum Spin Force – Swing Bucket			
5,000 to 50,000 MWCO PES	Do not use	4,000 xg	4,000 xg
>100,000 MWCO PES	Do not use	4,000 xg	3,000 xg
Maximum Spin Force – Fixed Angle			
5,000 to 50,000 MWCO PES	12,000 xg	8,000 xg	6,000 xg
>100,000 MWCO PES	12,000 xg	6,000 xg	6,000 xg

Chemical Compatibility

Spin-X UF® concentrators are designed for use with biological fluids and aqueous solutions. For chemical compatibility details, refer to Table 6.

Table 6. Chemical Compatibility*
(2-hour contact time; compatible pH range, pH 1-9)

Acetic Acid (25.0%)	1	Lactic Acid (5.0%)	1
Acetone (10.0%)	3	Mercaptoethanol (10 mL)	1
Acetonitrile (10.0%)	3	Methanol (60%)	2
Ammonium Hydroxide (5.0%)	2	Nitric Acid (10.0%)	1
Ammonium Sulphate (saturated)	1	Phenol (1.0%)	2
Benzene (100%)	3	Phosphate Buffer (1.0 M)	1
n-Butanol (70%)	1	Polyethylene Glycol (10%)	1
Chloroform (1.0%)	3	Pyridine (100%)	2
Dimethyl Formamide (10.0%)	2	Sodium Carbonate (20%)	2
Dimethyl Sulfoxide (5.0%)	1	Sodium Deoxycholate (5.0%)	1
Ethanol (70.0%)	1	Sodium Dodecylsulfate (0.1 M)	1
Ethyl Acetate (100%)	3	Sodium Hydroxide	3
Formaldehyde (30%)	1	Sodium Hypochlorite (200 ppm)	2
Formic Acid (5.0%)	1	Sodium Nitrate (1.0%)	1
Glycerine (70%)	1	Sulfamic Acid (5.0%)	1
Guanidine HCl (6 M)	1	Tetrahydrofuran (5.0%)	3
Hydrocarbons, aromatic	3	Toluene (1.0%)	3
Hydrocarbons, chlorinated	3	Trifluoroacetic Acid (10%)	1
Hydrochloric Acid (1 M)	1	Tween 20 (0.1%)	1
Imidazole (500 mM)	1	Triton X-100 (0.1%)	1
Isopropanol (70%)	1	Urea (8 M)	1

*1 = acceptable; 2 = questionable, testing advised; 3 = not recommended

Ordering Information

Spin-X® UF Concentrator

Cat. No.	Description	Capacity	Membrane	Qty/Cs
431477	Spin-X UF 500	500 µL	5,000 MWCO	25
431478	Spin-X UF 500	500 µL	10,000 MWCO	25
431479	Spin-X UF 500	500 µL	30,000 MWCO	25
431480	Spin-X UF 500	500 µL	50,000 MWCO	25
431481	Spin-X UF 500	500 µL	100,000 MWCO	25

431482	Spin-X UF 6	6 mL	5,000 MWCO	25
431483	Spin-X UF 6	6 mL	10,000 MWCO	25
431484	Spin-X UF 6	6 mL	30,000 MWCO	25
431485	Spin-X UF 6	6 mL	50,000 MWCO	25
431486	Spin-X UF 6	6 mL	100,000 MWCO	25

431487	Spin-X UF 20	20 mL	5,000 MWCO	12
431488	Spin-X UF 20	20 mL	10,000 MWCO	12
431489	Spin-X UF 20	20 mL	30,000 MWCO	12
431490	Spin-X UF 20	20 mL	50,000 MWCO	12
431491	Spin-X UF 20	20 mL	100,000 MWCO	12

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