Desalting and Buffer Exchange with Corning® Spin-X® UF Centrifugal Concentrators

Protocol

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Spin-X UF 500 Centrifugal Concentrator

Spin-X UF 6 Centrifugal Concentrator

Spin-X UF 20 Centrifugal Concentrator

Introduction

Spin-X UF centrifugal concentrators, with vertical membrane technology, combine fast filtration with high recovery of target proteins. This makes Spin-X UF the technology of choice for desalting or buffer exchange, avoiding lengthy dialysis steps.

While proteins are retained by an appropriate ultrafiltration membrane, salts can pass freely through, independent of protein concentration or membrane molecular weight cut-off (MWCO). In consequence, the composition of the buffer in the flow-through and retentate is unchanged after protein concentration. By diluting the concentrate back to the original volume, the salt concentration is lowered.

The concentrate can be diluted with water or salt-free buffer if simple desalting is required; however, it is also possible to dilute the concentrate with a new buffer, thereby exchanging the buffering substance entirely. For example, a 10 mL protein sample containing 500 mM salt concentrated 100-fold still contains 500 mM salt. If this concentrate is then diluted 100-fold with water or salt-free buffer, the protein concentration returns to normal, while the salt concentration is reduced 100-fold to only 5 mM, (i.e., a 99% reduction in salt). The protein sample can then be concentrated again to the desired level or the buffer exchange can be repeated to reduce the salt concentration even further before a final concentration of the protein. This process is called “diafiltration.”

For proteins with a tendency to precipitate at higher concentrations, it is possible to perform several diafiltration steps in sequence with the protein concentrated each time to only 5- or 10-fold. For example, if a precipitous protein sample is concentrated 5-fold then diluted back to the original volume and this process is repeated a further two times, this still results in a greater than 99% reduction in salt concentration without over-concentrating the protein.

Desalting and Buffer Exchange Procedure

1. Select the most appropriate MWCO for your sample. For maximum recovery, select a MWCO 1/2 to 1/3 the molecular size of the species of interest.
2. Add the solution to be desalted to the upper chamber of the Spin-X UF concentrator. See Table 1 to determine maximum volume, check the instructions that came with the concentrator.
3. If the sample is smaller than the maximum concentrator volume, it can be diluted up to the maximum volume with the replacement buffer before the first centrifugation step. This will help increase the salt removal rate.
4. Centrifuge for the recommended amount of time at an appropriate spin speed for your Spin-X UF concentrator (Table 1). When fixed angle rotors are used, angle the concentrator so that the printed window faces upwards (outwards). **Note**: This step concentrates the proteins in the solution remaining in the upper chamber but does not change the salt concentration in either chamber.

Table 1. Maximum Recommended Maximum Volume and (Centrifugal Force) for Spin-X® UF Concentrators

Concentrator	Spin-X UF 500	Spin-X UF 6	Spin-X UF 20
Maximum Volume and (Spin Force – Swing Bucket)			
5,000 to 50,000 MWCO PES	Do not use	6 mL (4,000 x g)	20 mL (5,000 x g)
100,000 MWCO PES	Do not use	6 mL (4,000 x g)	20 mL (3,000 x g)
Maximum Volume and (Spin Force – Fixed Angle)			
5,000 to 50,000 MWCO PES	500 µL (15,000 xg)	6 mL (10,000 x g)	14 mL (8,000 x g)
100,000 MWCO PES	500 µL (15,000 xg)	6 mL (6,000 x g)	14 mL (6,000 x g)

5. Empty the lower filtrate container which should now contain the salt or buffer solution minus the proteins. **Note**: Retain filtrate until the concentrated sample has been analyzed.
6. Refill the upper concentrator chamber with an appropriate replacement solvent or buffer. This dilutes both the proteins and remaining salts.
7. Centrifuge again as before. **Note**: This step concentrates the proteins in the solution remaining in the upper chamber while removing almost all of the salt.
8. Empty filtrate container. **Note**: Retain filtrate until the concentrated sample has been analyzed.
9. Recover the concentrated, desalted sample from the bottom of the concentrate pocket in the upper chamber with a pipettor fitted with a fine tip.

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 concentrator 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 (except for the Spin-X UF 500 which must always be run in a fixed angle rotor). 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 1).
- Avoid over concentration. The smaller the final concentrated solute volume in the upper concentrator chamber, the more difficult it is to achieve complete recovery. If feasible, after a first recovery, rinse the concentrator with one or more drops of buffer and then recover again.

Test Results

As the results below show (Tables 2 and 3), the efficient design of Spin-X UF concentrators allowed greater than 95% of the salt to be removed during the first centrifugation step. Only one subsequent centrifugation step was needed to increase the typical salt removal to 99% with greater than 92% recovery of the sample.

Spin-X® UF 20 Concentrator Results

Table 2. Results of Desalting Procedure Using Spin-X UF 20 Concentrators

MWCO	5 kDa		30 kDa		50 kDa		100 kDa	
	Cytochrome C 0.25 mg/mL		BSA 1 mg/mL		BSA 1 mg/mL		IgG 1 mg/mL	
	Protein Recovery	NaCl Removal	Protein Recovery	NaCl Removal	Protein Recovery	NaCl Removal	Protein Recovery	NaCl Removal
Spin 1	100%	99%	97%	99%	97%	99%	90%	98%
Spin 2	96%	100%	92%	100%	93%	100%	87%	100%

Four of Spin-X UF 20 concentrators of each cut-off were tested with 20 mL of solution. Each of the solutions contained 500 mM NaCl. Each spin was performed at 4,000 xg. The devices with greater than 5kDa MWCO were spun for 30 minutes. Concentrators with 5 kDa MWCO were spun 45 minutes. After the first and second spin, the retentate was brought up to 20 mL with ultra pure water from an Arium® purification system (Sartorius Stedim Biotech). OD readings were taken at 410 nm for the Cytochrome C and 280 nm for the BSA and IgG samples. Salt concentration was measured with a Qcond 2200 conductivity instrument.

Spin-X UF6 Concentrator Results

Table 3. Results of Desalting procedure using Spin-X UF 6 concentrators

MWCO	5 kDa		30 kDa		50 kDa		100 kDa	
	Cytochrome C 0.25 mg/mL		BSA 1 mg/mL		BSA 1 mg/mL		IgG 1 mg/mL	
	Protein Recovery	NaCl Removal	Protein Recovery	NaCl Removal	Protein Recovery	NaCl Removal	Protein Recovery	NaCl Removal
Spin 1	98%	99%	92%	99%	93%	99%	92%	98%
Spin 2	85%	100%	86%	100%	83%	100%	89%	100%

Four Spin-X UF 6 concentrators of each cut-off were tested with 6 ml of solution. Each of the solutions contained 500 mM NaCl. Each spin was performed at 4,000 xg. The concentrators with MWCO greater than 5 kDa were spun for 30 minutes. Concentrators with 5 kDa cut-offs were spun 45 minutes. After the first and the second spin the retentate was brought up to 6 mL with ultra pure water from the Arium purification system (Sartorius Stedim Biotech). OD readings were taken at 410 nm for the Cytochrome C and 280 nm for the BSA and IgG samples. Salt concentration was measured with a Qcond 2200 conductivity instrument.

Treatment of Corning® Spin-X® UF Concentrators for Improved Recovery of Low-Concentrated Protein Samples

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Spin-X UF 500 Concentrator

Spin-X UF 6 Concentrator

Spin-X UF 20 Concentrator

Introduction

With appropriate device size and membrane cut-off selected, Spin-X UF concentrators will typically yield recoveries for the concentrated sample greater than 90% when the starting sample contains over 0.1 mg/mL protein of interest.

Although dependent on the sample characteristics, solute (protein) adsorption on the polyethersulfone (PES) membrane surface is typically very low (2 to 10 µg/cm^2) and in practice is not detectable. Typically, a higher molecular cut-off (MWCO) membrane will bind more solute than a low MWCO membrane. Sample losses through adsorption can increase to 20 to 100 µg/cm^2 when a solute in the filtrate is of interest and it must pass through the whole internal structure of the ultrafiltration (UF) concentrator membrane. While the relative adsorption to the plastic surface of the sample container will be proportionately less than on the membrane (due to the membrane's higher total internal surface area), binding to the plastic surface of the upper and lower chambers can still be a source of yield loss. Whenever possible, choose the lowest MWCO membrane in the smallest concentrator applicable. Swinging bucket rotors are preferred to fixed angle rotors because they reduce the surface area of the concentrator that will be exposed to the solution during centrifugation.

An important factor not to be neglected is the thorough recovery of the retentate. Make sure to carefully remove all traces of solution from the upper sample container and, if feasible, rinse the device after recovering the sample with one or more drops of buffer and then recover again.

The intention of the following passivation procedure is to improve recovery of protein samples in the nanogram to microgram concentration range by pretreating (passivating) the concentrator to block or coat its membrane and plastic surfaces to reduce their "stickiness" for the solute molecules of interest. For this purpose a range of solutions are suggested in Table 1.

Passivation procedure for Spin-X UF concentrators

1. Wash the concentrators once by filling with high purity water and spin the liquid through according to the respective protocol.
2. Remove residual water thoroughly by pipetting. **Caution: Take care not to damage the membrane with the pipette tip.**
3. Fill concentrators with the blocking solution of choice as given in Table 1.

Table 1. Passivation Solutions

Type	Concentration
Powdered milk	1% in high purity water
BSA	1% in PBS
Tween 20	5% in high purity water
SDS	5% in high purity water
Triton X-10	0.5% in high purity water
PEG 3000	5% in high purity water

4. Incubate the filled concentrators at room temperature for at least 2 hours (overnight is also possible except for **Triton X-100 which is not recommended for overnight incubation**).

5. Pour out the blocking solution.
6. Rinse the device 3 to 4 times very thoroughly with high purity water and finally spin through.
7. The concentrators are now passivated or blocked and ready for use. We recommend evaluating different passivation reagents by comparing passivated concentrators side by side against untreated concentrators.

Note: It is necessary to rinse the concentrator thoroughly before each wash/spin to ensure that traces of passivation compound are entirely removed from the bottom of the upper chamber. Use the concentrator immediately for protein concentration or store it at 4°C filled with high purity water, to prevent the membrane from drying.

Corning® Spin-X® UF Concentrator Ordering Information

Cat. No.	Description	Capacity	Membrane	Pack Size
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

For additional product or technical information, please e-mail us at CLStechserv@corning.com, visit **www.corning.com/lifesciences**, or call 1.800.492.1110. Outside the United States, please call 1.978.442.2200.

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Corning® Spin-X® UF 6 and 20 mL Concentrators

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Technical Data and Operating Instructions

For *in vitro* use only.

Introduction

Corning® Spin-X® UF concentrators are disposable, single use only ultrafiltration devices with polyethersulfone membranes (PES) for the concentration and/or purification of biological samples. Spin-X UF 6 concentrators are suitable for sample volumes of 2 to 6 mL and the Spin-X UF 20 concentrators can handle samples up to 20 mL. Both products feature twin vertical membranes for unparalleled speed.

The innovative design, ease of use, speed and exceptional concentrate recoveries are the main features of the concentrators.

Storage Conditions and Shelf Life

Spin-X UF concentrators should be stored at room temperature. The devices should be used before the expiration date printed on the box.

Chemical Compatibility

Spin-X UF concentrators are designed for use with biological fluids and aqueous solutions. For chemical compatibility details, refer to Table 4 (page 6).

Centrifugal Operation

Spin-X UF concentrators can be used in swing bucket or fixed angle rotors accepting standard 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 longitudinal membrane orientation and thin channel concentration chamber provide optimum cross flow conditions even for particle laden solutions; the centrifugal force pulling particles and solids away from the membrane to the bottom of the device. Macromolecules collect in an impermeable concentrate pocket integrally molded below the membrane surface, thereby eliminating the risk of filtration to dryness.

Required Equipment

1. Centrifuge with swing bucket or fixed angle rotor (minimum 25°).

Device	Carrier Required
Spin-X UF 6	To fit 15 mL (17 mm diameter) conical bottom tubes
Spin-X UF 20	To fit 50 mL (30 mm diameter) conical bottom tubes

2. Pasteur or standard pipets for sample addition. Pipettors with gel loading tips are recommended for sample removal from the concentrate pocket.

Rotor Compatibility

Please note: Spin-X UF 20 (30 mm x 116 mm) is designed to fit into rotors that can accommodate Corning 50 mL conical bottom tubes, e.g., Beckman Allegra 25R with TS-5.1-500 swing-out rotor with BUC 5 buckets and 368327 adaptors; Beckman TA-10.250 25° fixed angle rotor with 356966 adaptors; Heraeus Multifuge 3 S-R with (Heraeus/Sorvall) 75006445 swing out rotor with 75006441 buckets and adaptors for Corning 50 mL conical bottom tubes.

These devices are not designed to fit into rotors that only accept round bottom 29 mm x 10^5 mm tubes, e.g., Sorvall SS34 or Beckman JA 20.

Operation

1. Select the most appropriate membrane cut-off for your sample. For maximum recovery select a molecular weight cut off (MWCO) at least 50% smaller than the molecular size of the species of interest.
2. Fill concentrator with up to maximum volumes shown in Table 1 (page 4). Ensure screw closure is fully seated.
3. Insert assembled concentrator into centrifuge (when fixed angle rotors are used, angle concentrator so that the printed window faces upwards/outwards).
4. Centrifuge at speeds recommended in Table 2 (page 5), taking care not to exceed the maximum g force indicated by membrane type and MWCO.
5. Once the desired concentration is achieved, (see Tables 3a and 3b, page 5) for guide to concentration times), remove assembly and recover sample from the bottom of the concentrate pocket with a pipet.

Desalting/Buffer Exchange

1. Concentrate sample to desired level.
2. Empty filtrate container.
3. Refill concentrator with an appropriate solvent.
4. Concentrate the sample again and repeat the process until the concentration of the contaminating micro-solute is sufficiently reduced. Typically, 3 wash cycles will remove 99% of initial salt content.

Removing the Spin-X® UF Body from the Filtrate Tube

The sleeve (seen from the end) is oval in cross section (Figure 1). The tube is round in cross section to give a tight fit to the sleeve. To release the tube from the sleeve, you must pinch the tube — to press it into an oval shape — before removing it with a twisting action.

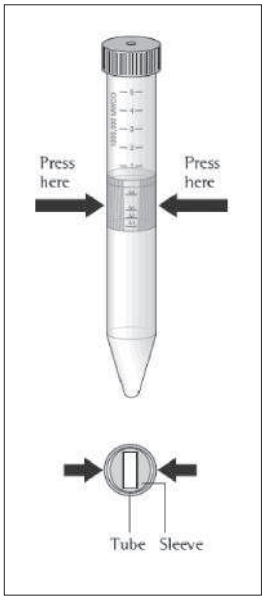

Figure 1.

Helpful Hints

1. Flow Rate

Filtration 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.

2. 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 pre-rinsed device immediately, store it in the refrigerator with buffer or water covering the membrane surface. Please do not allow the membrane to dry out.

3. Sterilization of Polyethersulfone Membranes

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

Technical Specifications

Table 1. Technical Properties

	Spin-X UF 6	Spin-X UF 20
Concentrator Capacity		
Swing bucket rotor	6 mL	20 mL
Fixed angle rotor	6 mL	14 mL
Dimensions		
Total length	122 mm	116 mm
Width	17 mm	30 mm
Active membrane area	2.5 cm^2	6.0 cm^2
Hold up volume of membrane	<10 µL	<20 µL
Dead stop volume*	30 µL	50 µL
Materials of Construction		
Body	Polycarbonate	Polycarbonate
Filtrate vessel	Polycarbonate	Polycarbonate
Concentrator cap	Polypropylene	Polypropylene
Membrane	Polyethersulfone	Polyethersulfone

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

Table 2. Maximum Recommended Spin Force (xg)

	Swing Bucket	Fixed Angle
Spin-X® UF 6		
5,000 to 50,000 MWCO PES	4,000 xg	10,000 xg
100,000 MWCO PES	4,000 xg	6,000 xg
Spin-X UF 20		
5,000 to 50,000 MWCO PES	5,000 xg	8,000 xg
100,000 MWCO PES	3,000 xg	6,000 xg

Table 3a. Performance Characteristics Spin-X UF 6

(Time to concentrate up to 30x [min.] at 20°C and solute recovery %)

Rotor	Swing Bucket		25° Fixed Angle	
Start Volume	6 mL		6 mL	
	Min.	Rec.	Min.	Rec.
BSA 1.0 mg/mL (66,000 MW)				
5,000 MWCO PES	20	98%	12	98%
10,000 MWCO PES	13	98%	10	98%
30,000 MWCO PES	12	98%	9	97%
IgG 0.25 mg/mL (160,000 MW)				
30,000 MWCO PES	18	96%	15	95%
50,000 MWCO PES	17	96%	14	95%
100,000 MWCO PES	15	91%	12	91%

Table 3b. Performance Characteristics Spin-X UF 20

(Time to concentrate up to 30x [min.] at 20°C and solute recovery %)

Rotor	Swing Bucket		25° Fixed Angle	
Start Volume	20 mL		14 mL	
	Min.	Rec.	Min.	Rec.
BSA 1.0 mg/mL (66,000 MW)				
5,000 MWCO PES	23	99%	29	99%
10,000 MWCO PES	16	98%	17	98%
30,000 MWCO PES	13	98%	15	98%
IgG 0.25 mg/mL (160,000 MW)				
30,000 MWCO PES	27	97%	20	95%
50,000 MWCO PES	27	96%	22	95%
100,000 MWCO PES	25	91%	20	90%

Table 4. 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 mM)	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 HCI (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.

Corning® Spin-X® UF Concentrators Ordering Information

Cat. No.	Description	Capacity	Membrane	Pack Size
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

Corning® Spin-X® UF 500 µL Concentrators

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Technical Data and Operating Instructions

For *in vitro* use only.

Introduction

Spin-X® UF concentrators are disposable, single use only ultrafiltration devices with polyethersulfone membranes (PES) for the concentration and/or purification of biological samples. Spin-X UF 500 concentrators are suitable for sample volumes of 100 to 500 µL. Thevertical membrane design and thin channel filtration chamber minimizes membrane fouling and provides high speed concentrations, even with particle laden solutions.

Storage Conditions and Shelf Life

Spin-X UF concentrators should be stored at room temperature. The devices should be used before the expiration date printed on the box.

Chemical Compatibility

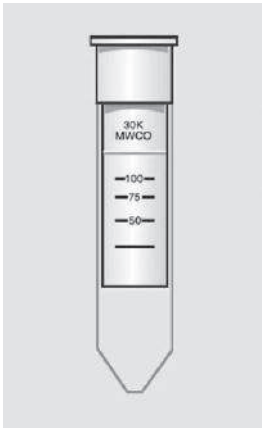
Spin-X UF concentrators are designed for use with biological fluids and aqueous solutions. For chemical compatibility details, refer to Table 3 (page 5).

Centrifugal Operation

Spin-X UF 500 concentrators can be used in a benchtop fixed angle rotor, accepting 2.2 mL centrifuge tubes. In a single spin, solutions can be concentrated approximately 100-fold.

Required Equipment

1. Centrifuge with fixed angle rotor (minimum 40°) that can fit 2.2 mL (11 mm diameter) conical bottom tubes.
2. Fixed or variable volume pipettors with gel loading tips are recommended for sample addition and removal.



Corning Spin-X UF 500 – 100 to 500 µL capacity

Operation

1. Select the most appropriate membrane cut-off for your sample. For maximum recovery select a molecular weight cut off (MWCO) at least 50% smaller than the molecular size of the species of interest.
2. Fill concentrator with up to a maximum volume of 500 µL as shown in Table 1 (Ensure lid is fully seated).
3. Insert assembled concentrator into a centrifuge with a fixed angle rotor. Minimum rotor angle is 40º. Angle concentrator so that the printed window faces upwards/ outwards.
4. Centrifuge at speeds up to 15,000 xg.
5. Once the desired concentration is achieved, remove assembly and recover sample from the bottom of the concentrate pocket with a pipettor and gel loading tip. See Table 2 (page 4) for a guide to concentration times. The filtrate tube can be sealed for storage.

Desalting/Buffer Exchange

1. Concentrate sample to desired level.
2. Empty filtrate container.
3. Refill concentrator with an appropriate solvent.
4. Concentrate the sample again and repeat the process until the concentration of the contaminating microsolute is sufficiently reduced. Typically, 3 wash cycles will remove 99% of initial salt content.

Helpful Hints

1. Flow Rate

Filtration 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.

2. 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 pre-rinsed device immediately, store it in the refrigerator with buffer or water covering the membrane surface. Please do not allow the membrane to dry out.

3. Sterilization of Polyethersulfone Membranes

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

Technical Specifications

Table 1. Technical Properties

	Spin-X® UF 500
Concentrator Capacity	
Swing bucket rotor	Do not use
Fixed angle rotor	500 µL
Minimum rotor angle	40º
Dimensions	
Total length	50 mm
Width	11 mm
Active membrane area	0.5 cm^2
Hold up volume of membrane	<5 µL
Dead stop volume*	5 µL
Materials of Construction	
Body	Polycarbonate
Filtrate vessel	Polypropylene
Concentrator cap	Polycarbonate
Membrane	Polyethersulfone
Maximum Spin Force (Fixed angle only)	
5,000 to 50,000 MWCO PES	15,000 xg
>100,000 MWCO PES	15,000 xg

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

Table 2. Performance Characteristics Spin-X UF 500

(Time to concentrate up to 30x [min.] at 20°C and solute recovery %)

Rotor	**40° Fixed Angle**	
Start Volume	**500 µL**	
	Min.	**Rec.**
BSA 1.0 mg/mL (66,000 MW)		
5,000 MWCO PES	15	96%
10,000 MWCO PES	5	96%
30,000 MWCO PES	5	95%
IgG 0.25 mg/mL (160,000 MW)		
30,000 MWCO PES	10	96%
50,000 MWCO PES	10	96%
100,000 MWCO PES	10	96%

Table 3. 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 mM)	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 HCI (6M)	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.

Corning® Spin-X® UF 500 Concentrator Ordering Information

Cat. No.	Description	Capacity	Membrane	Pack Size
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