

Instructions for Use

Vivaspin® Turbo 4 and 15

Vivaspin® Turbo 4 and 15 3K, 5K, 10K, 30K, 50K, and 100K devices for research use only; not for use in diagnostic procedures



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1 Vivaspin® Turbo 4 and 15 – Introduction

1.1 Storage Conditions | Shelf Life

Vivaspin® Turbo ultrafiltration spin columns should be stored at 15–30°C. The devices should be used before the expiry date printed on the box.

1.2 Introduction

Vivaspin® Turbo centrifugal concentrators offer the optimal solution to any concentration or buffer exchange application with their broad range of MWCOs prior to further sample analysis.

Vivaspin® Turbo 4 is suitable for initial sample volumes of 2–4 ml and the Vivaspin® Turbo 15 can handle samples up to 15 ml. Highest flow rates are achieved due to their double vertical membranes which minimize protein polarization and subsequent fouling of the membrane. Additionally, their sleek internal profile ensures maximum process speeds right down to the last drops. The UV joining technology allows for a smooth joint transition between membrane and plastic housing, allowing complete sample recovery from the unique pipette friendly deadstop pocket. The dead stop pocket (patent pending) is an impermeable concentrate pocket integrally moulded below the membrane surface, thereby eliminating the risk of filtration to dryness.

The Vivaspin® Turbo 4 and 15 devices are the optimal solution for protein concentration from dilute samples e.g. after chromatography, cell culture supernatants or fermentation broths.

The Vivaspin® Turbo product line includes 6 different cutoffs (Molecular Weight Cutoff, MWCO):

- Vivaspin® Turbo 4 & 15 3K device: 3,000 MWCO
- Vivaspin® Turbo 4 & 15 5K device: 5,000 MWCO
- Vivaspin® Turbo 4 & 15 10K device: 10,000 MWCO
- Vivaspin® Turbo 4 & 15 30K device: 30,000 MWCO
- Vivaspin® Turbo 4 & 15 50K device: 50,000 MWCO
- Vivaspin® Turbo 4 & 15 100K device: 100,000 MWCO

Vivaspin® Turbo 4 & 15 filter devices are for research use only and not for use in diagnostic procedures. The Vivaspin® Turbo 4 and 15 devices are supplied non-sterile and are for single use only.

1.3 Operation

Vivaspin® Turbo 4 and 15 concentrators can be used in swing bucket or fixed angle rotors accepting standard conical bottom tubes. In a single spin, solutions can be concentrated up to 150 ×. Samples are typically concentrated in 10 to 30 minutes with macromolecular recoveries in excess of 95%.

2 Equipment Required

2.1 For Use With Centrifuge

1. Centrifuge with swing bucket or fixed angle rotor (minimum 25°).
2. Pasteur or fixed volume pipettes for sample delivery and removal.

Device	Carrier Required
Vivaspin® Turbo 4	15 ml 17 mm Ø
Vivaspin® Turbo 15	50 ml 30 mm Ø

Equipment required	Vivaspin® Turbo 4		Vivaspin® Turbo 15	
Centrifuge				
Rotor type	Swing bucket	Fixed angle	Swing bucket	Fixed angle
Minimum rotor angle	-	25°	-	25°
Rotor cavity	To fit 15 ml (17 mm) conical bottom tubes		To fit 50 ml (30 mm) conical bottom tubes	

2.2 Rotor Compatibility

Please note: Vivaspin® Turbo 15 (30 mm × 118 mm) is designed to fit into rotors that can accommodate Falcon 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 Falcon 50 ml conical bottom tubes.

These devices are not designed to fit into rotors that only accept round bottom 29 mm × 105 mm tubes, e.g. Sorvall SS34 or Beckman JA 20.

3 Operation

1. Select the most appropriate membrane cut-off for your sample. For maximum recovery select a 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. (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 sideways and the angular deadstop to the outside of the rotor).
4. Centrifuge at speeds recommended in table 2, taking care not to exceed the maximum g force indicated by membrane type and MWCO.
5. Once the desired concentration is achieved, (see table 3a and 3b for guide to concentration times), remove assembly and recover sample from the bottom of the concentrate pocket with a pipette.

3.1 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 contaminating microsolutes is sufficiently reduced. Typically, 3 wash cycles will remove 99% of initial salt content.

4 Technical Specifications

Table 1: Technical Specifications

	Vivaspin® Turbo 4	Vivaspin® Turbo 15
Dimensions		
Total Length	122.5 cm	118 mm in tube
Width	17 mm	27 mm
Active membrane area	3.2 cm ²	7.2 cm ²
Hold up volume of membrane	< 10 µl	<10 µl
Dead stop volume* in swing out	40 µl	100 µl
Dead stop volume in fixed angle (25°)	30 µl	60 µl
Concentrator Capacity		
Swing bucket rotor	4 ml	15 ml
Fixed angle rotor	4 ml	9 ml
Materials of construction		
Concentrator insert	Styrene butadiene block co-polymer	Styrene butadiene block co-polymer
Concentrator cap and tube	Polypropylene	Polypropylene
Membrane	Polyethersulfone	Polyethersulfone

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

Table 2: Recommended Spin Speed (xg)

Vivaspin® Turbo 4		Centrifuge	
Rotor	Swing Bucket	Fixed Angle	
Membrane	max	max	
3,000–50,000 MWCO PES	4,000	7,500	
100,000 MWCO PES	3,000	5,000	
Vivaspin® Turbo 15		Centrifuge	
Rotor	Swing Bucket	Fixed Angle	
Membrane	max	max	
3,000–50,000 MWCO PES	4,000	4,000	
100,000 MWCO PES	2,000	2,000	

5 Usage Tips

5.1 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% glycerine will take up to 5 times longer to concentrate than samples in a predominantly buffer solution.

5.2 Pre-rinsing

Membranes fitted to Vivaspin® concentrators contain trace amounts of Glycerine and Sodium azide. Should these interfere with analysis they can be removed by rinsing fill volume of buffer solution or deionised 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.

5.3 Sterilisation of Polyethersulfone Membranes

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

5.4 Chemical Compatibility

Vivaspin® concentrators are designed for use with biological fluids and aqueous solutions. For chemical compatibility details, refer to table 4.

6 Performance Characteristics

Table 3a.: Performance Characteristics Vivaspin® Turbo 4

Time to concentrate up to 20x [min.] at 20°C and solute recovery %				
Rotor	Swing bucket		Fixed angle (25°)	
Centrifugal speed	4,000 g		7,500 g	
Start volume	4 ml		4 ml	
	Min.	Rec.	Min.	Rec.
Cytochrome c* (12,400 MW)				
3 MWCO PES	60	98%	80	96%
Lysozyme* (14,300 MW)				
3 MWCO PES	65	95%	70	93%
Cytochrome c* (12,400 MW)				
5 MWCO PES	40	95%	50	94%
Lysozyme* (14,300 MW)				
5 MWCO PES	50	94%	60	92%
α -Chymotrypsin** (25,000 MW)				
10 MWCO PES	10	95%	8	95%
BSA** (66,000 MW)				
10 MWCO PES	10	98%	7	97%
30 MWCO PES	8	96%	6	97%

* 0,25 mg/ml

** 1 mg/ml

Time to concentrate up to 20x [min.] at 20°C and solute recovery %				
Rotor	Swing bucket		Fixed angle (25°)	
IgG** (160,000 MW)				
30 MWCO PES	18	94%	13	92%
50 MWCO PES	16	93%	12	90%
100 MWCO PES***	17	94%	13	92%

** 1 mg/ml

*** 3,000 × g swing-out | 5,000 × g fixed angle

Table 3b.: Performance Characteristics Vivaspin® Turbo 15

Time to concentrate up to 20x [min.] at 20°C and solute recovery %				
Rotor	Swing bucket		Fixed angle (25°)	
Centrifugal speed	4,000 g		4,000 g	
Start volume	15 ml		9 ml	
	Min.	Rec.	Min.	Rec.
Cytochrome c* (12,400 MW)				
3 MWCO PES	61	98%	86	97%
Lysozyme* (14,300 MW)				
3 MWCO PES	56	98%	87	97%
Cytochrome c* (12,400 MW)				
5 MWCO PES	30	98%	50	98%

* 0.25 mg/ml

Time to concentrate up to 20x [min.] at 20°C and solute recovery %				
Rotor	Swing bucket		Fixed angle (25°)	
Lysozyme* (14,300 MW)				
5 MWCO PES	33	96%	50	96%
α-Chymotrypsin** (25,000 MW)				
10 MWCO PES	10	95%	10	95%
BSA** (66,000 MW)				
10 MWCO PES	10	99%	10	99%
30 MWCO PES	8	98%	10	98%
IgG** (160,000 MW)				
30 MWCO PES	23	95%	17	95%
50 MWCO PES	20	94%	15	94%
100 MWCO PES***	30	92%	16	92%

* 0.25 mg/ml

** 1 mg/ml

*** 3,000 g × centrifugal speed

7 Chemical Compatibility

Table 4: Chemical Compatibility (2 hr contact time)

Solutions	PES
Compatible pH range	pH 1-14
Acetic Acid (25.0%)	OK
Acetone (10.0%)	OK
Acetonitrile (10.0%)	OK
Ammonium Hydroxide (5.0%)	?
Ammonium Sulphate (saturated)	OK
Benzene (100%)	NO
n-Butanol (70%)	OK
Chloroform (1.0%)	NO
Dimethyl Formamide (10.0%)	?
Dimethyl Sulfoxide (5.0%)	OK
Ethanol (70.0%)	OK
Ethyl Acetate (100%)	NO
Formaldehyde (30%)	OK
Formic Acid (5.0%)	OK
Glycerine (70%)	OK
Guanidine HCl (6 M)	OK
Hydrocarbons, aromatic	NO

Solutions	PES
Compatible pH range	pH 1-14
Hydrocarbons, chlorinated	NO
Hydrochloric Acid (1 M)	OK
Imidazole (500 mM)	OK
Isopropanol (70%)	OK
Lactic Acid (5.0%)	OK
Mercaptoethanol (10 mM)	OK
Methanol (60%)	OK
Nitric Acid (10.0%)	OK
Phenol (1.0%)	?
Phosphate Buffer (1.0 M)	OK
Polyethylene Glycol (10%)	OK
Pyridine (100%)	?
Sodium Carbonate (20%)	?
Sodium Deoxycholate (5.0%)	OK
Sodium Dodecylsulfate (0.1 M)	OK
Sodium Hydroxide (2M)	OK
Sodium Hypochlorite (200 ppm)	?
Sodium Nitrate (1.0%)	OK
Sulfamic Acid (5.0%)	OK
Tetrahydrofuran (5.0%)	NO
Toluene (1.0%)	NO

Solutions	PES
Compatible pH range	pH 1-14
Trifluoroacetic Acid (10%)	OK
Triton ^{®*} X-100 (0.1%)	OK
Tween ^{®**} 20 (0.1%)	OK
Urea (8 M)	OK

OK = Acceptable

? = Questionable

NO = Not recommended

* Triton[®] is a registered trademark of Union Carbide Corp.

** Tween[®] is a registered trademark of ICI Americas Inc.

8 Ordering Information

Vivaspin® Turbo 4

Cut off	Qty per box	Prod. no.
3,000 MWCO	25	VS04T91
3,000 MWCO	100	VS04T92
5,000 MWCO	25	VS04T11
5,000 MWCO	100	VS04T12
10,000 MWCO	25	VS04T01
10,000 MWCO	100	VS04T02
30,000 MWCO	25	VS04T21
30,000 MWCO	100	VS04T22
50,000 MWCO	25	VS04T31
50,000 MWCO	100	VS04T32
100,000 MWCO	25	VS04T41
100,000 MWCO	100	VS04T42

Vivaspin® Turbo 15

Cut off	Qty per box	Prod. no.
3,000 MWCO	12	VS15T91
3,000 MWCO	48	VS15T92
5,000 MWCO	12	VS15T11
5,000 MWCO	48	VS15T12

Cut off	Qty per box	Prod. no.
10,000 MWCO	12	VS15T01
10,000 MWCO	48	VS15T02
30,000 MWCO	12	VS15T21
30,000 MWCO	48	VS15T22
50,000 MWCO	12	VS15T31
50,000 MWCO	48	VS15T32
100,000 MWCO	12	VS15T41
100,000 MWCO	48	VS15T42









8.1 Other Products

Product	Sample volume	Mode	Membranes available
Vivaspin® 500	100 µl – 600 µl	Centrifugal	Polyethersulfone
Vivaspin® 2	0.4 ml – 2 ml	Centrifugal	Polyethersulfone, Cellulose Triacetate, Hydrosart®
Centrisart	0.5 ml – 2.5 ml	Centrifugal	Polyethersulfone, Cellulose Triacetate
Vivaspin® 6	2 ml – 6 ml	Centrifugal	Polyethersulfone
Vivaspin® 15R	2 ml – 15 ml	Centrifugal	Hydrosart®
Vivaspin® 20	5 ml – 20 ml	Centrifugal Gas pressure	Polyethersulfone
Vivacell 100	20 ml – 100 ml	Centrifugal Gas pressure	Polyethersulfone

Product	Sample volume	Mode	Membranes available
Vivaflow 50	100 ml ->5 l	Tangential flow	Polyethersulfone Regenerated Cellulose
Vivaflow 200	500 ml ->5 l	Tangential flow	Polyethersulfone, Hydrosart®
Vivaflow 50R	100 ml -1 l	Tangential flow	Hydrosart®
Vivapore 5	1 ml - 5 ml	Solvent absorption	Polyethersulfone
Vivapore 10/20	2 ml - 10 ml/ 20 ml	Solvent absorption	Polyethersulfone

9 Product Labeling

The following table defines the symbols found on Vivaspin® Turbo 4 & 15 10K device labels.

Symbol	Definition
	Catalogue number
	Do not reuse
	Use by
	Batch code
	Date of manufacture
	Manufacturer
	Temperature limitation
	Non-sterile product

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The information and figures contained in these instructions correspond to the version date specified below.

Sartorius reserves the right to make changes to the technology, features, specifications and design of the equipment without notice.

Masculine or feminine forms are used to facilitate legibility in these instructions and always simultaneously denote the other gender as well.

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