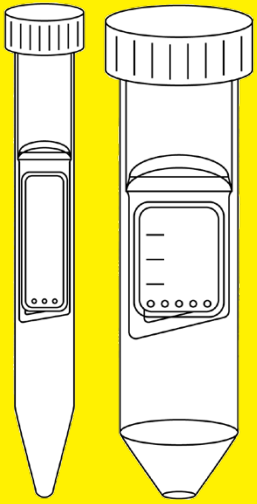
Instructions for Use

Vivaspin® Turbo 4 and 15

Centrifugal Ultrafiltration Units for General Laboratory Use



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1 About these Instructions

1.1 Scope

These instructions are part of the product. These instructions apply to the following versions of the product:

Vivaspin® Turbo 4	Quantity	Prod. no.
3 kDa	25 | 100	VS04T91 | VS04T92
5 kDa	25 | 100	VS04T11 | VS04T12
10 kDa	25 | 100	VS04T01 | VS04T02
30 kDa	25 | 100	VS04T21 | VS04T22
50 kDa	25 | 100	VS04T31 | VS04T32
100 kDa	25 | 100	VS04T41 | VS04T42

Vivaspin® Turbo 15	Quantity	Prod. no.
3 kDa	12 | 48	VS15T91 | VS15T92
5 kDa	12 | 48	VS15T11 | VS15T12
10 kDa	12 | 48	VS15T01 | VS15T02
30 kDa	12 | 48	VS15T21 | VS15T22
50 kDa	12 | 48	VS15T31 | VS15T32
100 kDa	12 | 48	VS15T41 | VS15T42

1.2 Target Groups

The instructions are designed for the following target groups. The target groups must possess the knowledge listed below.

Target Group	Knowledge and Qualifications
Operator	The operator is familiar with the device and the associated work processes. The operator understands the hazards which may arise when working with the device, and knows how to prevent them.

1.3 Symbols Used

1.3.1 Warnings in Operation Descriptions

NOTICE
Denotes a hazard that may result in property damage if it is **not** avoided.

1.3.2 Other Symbols

▶ Required action: Describes actions that must be carried out.
The actions in the sequence must be carried out in succession.

▷ Result: Describes the result of the actions carried out.

2 Safety Instructions

2.1 General Functions

The product is intended for the ultrafiltration and | or diafiltration of biological and aqueous solutions. The sample solutions and volumes used must be suitable for the product.

The filtration process must be carried out in a centrifuge. Macromolecules that are sufficiently larger than the nominal pore size of the membrane are retained above the membrane and progressively concentrated. The vertical membrane inhibits membrane fouling while the built-in dead stop impedes concentration to dryness and loss of sample.

The product is supplied non-sterile. It is intended for single use and must be disposed of after one use.

The product is intended exclusively for use in accordance with these instructions. Any further use beyond this is considered improper.

Operating Conditions for the Product

The product is intended for general laboratory use.

The product may only be used with the equipment and under the operating conditions described in the Technical Data section of these instructions.

2.2 Personnel Qualification

Persons without sufficient knowledge in the safe use of the device can injure themselves and others.

If a specific qualification is required for an activity: The target group is indicated. If no qualification is specified: The activity can be carried out by the target group “Operator”.

2.3 Significance of these Instructions

Failure to follow the instructions might have serious consequences, e.g. danger to individuals.

- ▶ Read the instructions carefully and completely. The instructions for action build on each other.
- ▶ Ensure that the information contained in these instructions is available to all individuals working with the product.

2.4 Functionality of the Product

A damaged product or worn parts can lead to malfunctions or cause hazards which are difficult to identify.

- ▶ Only operate the product when it is safe and in perfect working order.

3 Product Description

3.1 Vivaspin® Turbo 4

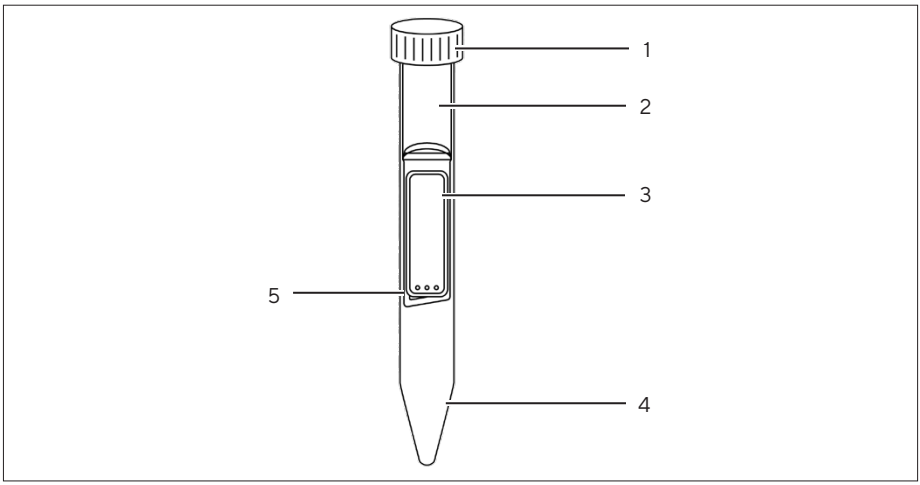


Fig. 1: Product overview (example)

Pos.	Description
1	Concentrator cap
2	Concentrator
3	Twin vertical membranes
4	Filtrate container
5	Angular dead stop pocket

3.2 Vivaspin® Turbo 15

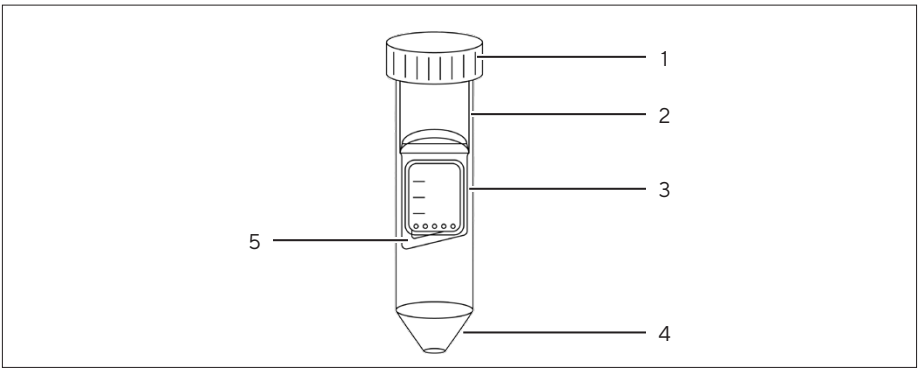


Fig. 2: Product overview (example)

Pos.	Description
1	Concentrator cap
2	Concentrator
3	Twin vertical membranes
4	Filtrate container
5	Angular dead stop pocket

3.3 Product Symbols

Symbol	Definition
	Catalogue number
	Batch code
	Use by
	Consult instructions for use
	Temperature limits
	**Non**-sterile product
	Do **not** reuse

4 Process Preparation

4.1 Scope of Delivery

Article	Quantity
Product packed in a cardboard box	
Vivaspin® Turbo 4	25 or 100
Vivaspin® Turbo 15	12 or 48
Instructions for Use	1

4.2 Unpacking

Procedure

- **NOTICE** Risk of product malfunctions due to exceeding the usability! Check the usability of the product (see specification on packaging). Dispose of products for which the usability has been exceeded.
- Unpack the product.

5 Operation

5.1 Pre-Rinsing the Product

Membranes in the product may contain traces of glycerin. If this substance can interfere with the analysis of the sample: The membranes may be rinsed before filtration.

Procedure

- ▶ Remove the concentrator cap.
- ▶ Use a pipette to apply a filling volume of buffer solution or deionized water into the concentrator.
- ▶ Replace the concentrator cap.
- ▶ Wash the buffer solution or deionized water through the membranes by centrifugation.
- ▶ Empty the concentrator and filtrate container.
- ▶ If the pre-rinsed product is not used immediately: Cover the surface of the membranes with buffer solution or water and store the product in the refrigerator. The membranes must not dry out.

5.2 Sanitizing the Product

The product can be sanitized before use. The sanitizing method must be suitable for the product (see Chapter “8.6 Sanitizing Methods”, page 22).

Procedure

- ▶ Remove the concentrator cap.
- ▶ Sanitize the product using the desired sanitizing method.
- ▶ Empty the product.

5.3 Performing Filtration

5.3.1 Applying the Sample

It is recommended that a pipette is used to apply the sample into the product. The pipette must be compatible with the product (see Chapter “8.5.1 Pipettes”, page 22).

Please ensure that the molecular weight cut-off (MWCO) of the product is suitable for the size of the target molecule to be concentrated. In order to ensure maximum recovery of the target molecule, we recommend selecting a MWCO that is at least 50% below the size of the target molecule.

NOTICE

Risk of product malfunctions due to using unsuitable samples!

- ▶ Only pour suitable samples into the product (see Chapter “8.7 Chemical Compatibility“, page 23).

NOTICE

Risk of product malfunctions or damage to the centrifuge due to exceeding the maximum filling volume!

- ▶ Do **not** exceed the maximum filling volume (see Chapter “8.4.1 Filtration Volumes“, page 20).

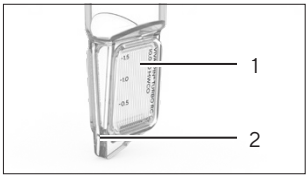
Procedure

- ▶ Check whether the MWCO of the product is suitable for the application.
- ▶ Remove the concentrator cap.
- ▶ Apply the sample into the product using a pipette. Comply with the maximum filling volume.
- ▶ Replace the concentrator cap.

5.3.2 Inserting the Product into the Centrifuge

Procedure

- ▶ **NOTICE** Risk of product malfunctions or damage to the centrifuge! Only use the product in suitable centrifuges (see Chapter "8.5.2 Centrifuges", page 22)
- ▶ Insert the product into the centrifuge.
- ▶ If a centrifuge with fixed-angle rotor is used: Place the product into the centrifuge as follows:
  - The printed volume graduations on the concentrator (1) are facing sideways.
  - The dead stop pocket of the concentrator (2) is pointing towards the outside of the fixed-angle rotor.



5.3.3 Performing Filtration

Procedure

- ▶ **NOTICE** Risk of product malfunctions or damage to the centrifuge. Comply with the approved centrifugation limit values (see Chapter "8.4.2 Centrifugation Limit Values", page 21).
- ▶ Centrifuge the product in the centrifuge until the desired concentration level is achieved.

5.3.4 Removing the Sample

Procedure

- If the filtration or concentration is complete: Remove the product from the centrifuge.
- Remove the concentrator cap.
- Recover the sample from dead stop pocket of the concentrator using a pipette.
- If the membrane was pre-rinsed before filtration: Decant the filtrate and concentrate.

5.4 Desalting or Buffer Exchange

Procedure

- Concentrate the sample to the desired level.
- Remove the concentrator cap.
- Discard the filtrate.
- Refill the concentrator with an appropriate exchange buffer.
- Concentrate the sample again.
- Repeat the process until the original buffer and | or contaminating micro-solute has been sufficiently removed.
- If the desalting or buffer exchange is complete: Recover the sample.

6 Storage

6.1 Storing the Product

If the product has been unpacked and the membranes have been pre-rinsed: The membranes must be protected against drying out. For this purpose, the membranes must be stored in a moist and cool condition.

NOTICE

Risk of damage to the product due to improper storage!

- ▶ Comply with the storage specifications.

Procedure

- ▶ If the product is packaged: Store the product in the packaging.
- ▶ If the product has been unpacked and the membrane has been pre-rinsed:
  - ▶ Remove the concentrator cap.
  - ▶ Cover the membrane with buffer solution or water.
  - ▶ Replace the concentrator cap.
- ▶ Store the product according to the ambient conditions (see Chapter "8.3 Ambient Conditions", page 20).

7 Disposal

7.1 Decontaminating the Product

If the product has come into contact with hazardous substances: Steps must be taken to ensure proper decontamination and declaration. The operator of the product is responsible for adhering to local government regulations on the proper decontamination and declaration for transport and disposal.

Procedure

▶ If the product has come into contact with hazardous substances: Decontaminate the product.

7.2 Disposing of the Product

The product must be disposed of properly. The packaging is made of environmentally friendly materials that can be used as secondary raw materials.

Requirements

The product must be decontaminated.

Procedure

▶ Dispose of the product in accordance with local government regulations.
▶ Dispose of the packaging in accordance with local government regulations.

8 Technical Specifications

8.1 Dimensions

	Vivaspin® Turbo 4		Vivaspin® Turbo 15	
	Unit	**Value**	**Unit**	**Value**
Length x Diameter	mm	122.5 x 17	mm	118 x 30
Active membrane surface	cm^2	3.2	cm^2	7.2
Weight	g	12	g	25

8.2 Materials

	Vivaspin® Turbo 4	Vivaspin® Turbo 15
Concentrator	Styrene butadiene coploymer (SBC)	Styrene butadiene coploymer (SBC)
Concentrator cap | Filtrate container	Polypropylene	Polypropylene
Membranes	Polyethersulfone	Polyethersulfone

8.3 Ambient Conditions

	Unit	Value
Storage temperature		
When packed	°C	+15 – +30
When unpacked, with membrane kept moist	°C	+2 – +8

8.4 Operating Conditions

8.4.1 Filtration Volumes

		Centrifuge with swing bucket rotor	Centrifuge with fixed-angle rotor (25°)
	Unit	Value	Value
Vivaspin® Turbo 4			
Filling volume, maximum	mL	4	4
Membrane hold-up volume, minimum	µL	< 10	< 10
Dead stop volume[1]	µL	40	30
Vivaspin® Turbo 15			
Filling volume, maximum	mL	15	9
Membrane hold-up volume, minimum	µL	< 10	< 10
Dead stop volume[1]	µL	100	60

[1]The dead stop volume may vary depending on the type and concentration of the sample, operating temperature and | or centrifuge rotor

8.4.2 Centrifugation Limit Values

	Centrifuge			
	Swing bucket rotor		Fixed-angle rotor	
	Unit	Value	Unit	Value
Vivaspin® Turbo 4		max.		max.
3 – 50 kDa PES	*g*	4,000	*g*	7,500
100 kDa PES	*g*	3,000	*g*	5,000
Vivaspin® Turbo 15		max.		max.
3 – 50 kDa PES	*g*	4,000	*g*	4,000
100 kDa PES	*g*	2,000	*g*	2,000

8.5 Equipment Required

8.5.1 Pipettes

Pasteur pipette, variable volume or fixed volume pipette for sample application and concentrate or filtrate retrieval

8.5.2 Centrifuges

Centrifuge with swing bucket rotor or fixed-angle rotor (minimum 25°) accepting conical base tubes.

	Required carriers	
	Unit	**Value**
Vivaspin® Turbo 4		
Volume	mL	15
Diameter	mm	17
Vivaspin® Turbo 15		
Volume	mL	50
Diameter	mm	30

8.6 Sanitizing Methods

Rinsing with 70% ethanol or with sanitizing gas mixture, e.g. ethylene oxide

Not suitable for autoclaving

8.7 Chemical Compatibility

Chemical, biological and aqueous solutions with appropriate compatibility for the materials of the product (2 hr contact time)	
Examples of compatible chemical solutions	
Acetic Acid (25%)	Mercaptoethanol (10 mM)
Acetone (10%)	Methanol (60%)
Acetonitrile (10%)	Nitric Acid (10%)
Ammonium Sulfate (saturated)	Phosphate Buffer (1 M)
Butanol (70%)	Polyethylene Glycol (10%)
Dimethyl Sulfoxide (5%)	Sodium deoxychloate (5%)
Ethanol (70%)	Sodium dodecylsulfate (0.1 M)
Formaldehyde (30%)	Sodium Hydroxide (2 M)
Formic acid (5%)	Sodium Nitrate (1%)
Glycerine (70%)	Sulfamic acid (5%)
Guanidine hydrochloride (6 M)	Trifluoroacetic Acid (10%)
Hydrochloric Acid (1 M)	Triton®* X-100 (0.1%)
Imidazole (500 mM)	Tween®** 20 (0.1%)
Isopropanol (70%)	Urea (8 M)
Lactic Acid (5%)	

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

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

8.8 Typical Performance Characteristics

8.8.1 Vivaspin® Turbo 4

Time to concentrate up to 20x at 20 °C				
Start Volume	4 mL		4 mL	
RCF	4,000 *g* in swing bucket rotor		7,500 *g* in fixed angle (25°) rotor	
	Time (min)	**Solute Recovery**	**Time (min)**	**Solute Recovery**
Cytochrome c 0.25 mg/mL (12.4 kDa MW)				
3 kDa PES	60	98%	80	96%
5 kDa PES	40	95%	50	94%
Lysozyme 0.25 mg/mL (14.3 kDa MW)				
3 kDa PES	65	95%	70	93%
5 kDa PES	50	94%	60	92%
α-Chymotrypsin 1 mg/mL (25 kDa MW)				
10 kDa PES	10	95%	8	95%
BSA 1 mg/mL (66 kDa MW)				
10 kDa PES	10	98%	7	97%
30 kDa PES	8	96%	6	97%
IgG 1 mg/mL (160 kDa MW)				
30 kDa PES	18	94%	13	92%
50 kDa PES	16	93%	12	90%
100 kDa PES*	17	94%	13	92%

* Relative centrifuge force = 3,000 *g* in swing out rotor or 5,000 *g* in fixed angle rotor

8.8.2 Vivaspin® Turbo 15

Time to concentrate up to 20x at 20 °C				
Start Volume	15 mL		9 mL	
RCF	4,000 *g* in swing bucket rotor		4,000 *g* in fixed angle (25°) rotor	
	Time (min)	**Solute Recovery**	**Time (min)**	**Solute Recovery**
Cytochrome c 0.25 mg/mL (12.4 kDa MW)				
3 kDa PES	61	98%	86	97%
5 kDa PES	30	98%	50	98%
Lysozyme 0.25 mg/mL (14.3 kDa MW)				
3 kDa PES	56	98%	87	97%
5 kDa PES	33	96%	50	96%
α-Chymotrypsin 1 mg/mL (25 kDa MW)				
10 kDa PES	10	95%	10	95%
BSA 1 mg/mL (66 kDa MW)				
10 kDa PES	10	99%	10	99%
30 kDa PES	8	98%	10	98%
IgG 1 mg/mL (160 kDa MW)				
30 kDa PES	23	95%	17	95%
50 kDa PES	20	94%	15	94%
100 kDa PES*	30	92%	16	92%

* Relative centrifuge force = 2,000 *g*

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