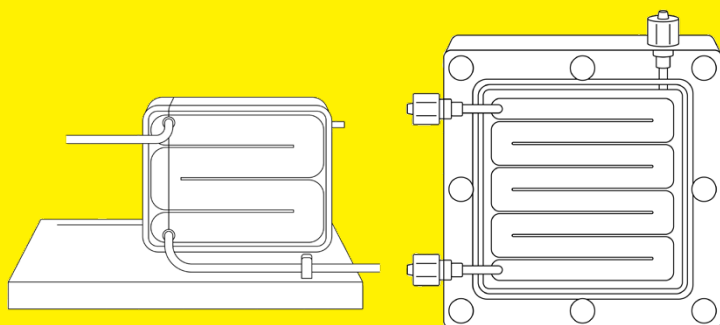


Instructions for Use

Vivaflow[®] 50 | 50R | 200

TFF Cassettes for Research Use Only



3104678-001-00



SARTORIUS

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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:

Article	Qty	Prod. no.
Vivaflow® 50		
includes feed, permeate and retentate tubing		
3 kDa PES	2	VF05P9
5 kDa PES	2	VF05P1
10 kDa PES	2	VF05P0
30 kDa PES	2	VF05P2
50 kDa PES	2	VF05P3
100 kDa PES	2	VF05P4
1,000 kDa PES	2	VP05P6
0.2 µm PES	2	VF05P7
Vivaflow® 50R		
includes feed, permeate, retentate tubing and pressure indicator		
5 kDa Hydrosart®	1	VF05H1
10 kDa Hydrosart®	1	VF05H0
30 kDa Hydrosart®	1	VF05H2
100 kDa Hydrosart®	1	VF05H4
Vivaflow® 200		
includes feed, permeate, retentate tubing and pressure indicator		
3 kDa PES	1	VF20P9

Article	Qty	Prod. no.
5 kDa PES	1	VF20P1
10 kDa PES	1	VF20P0
30 kDa PES	1	VF20P2
50 kDa PES	1	VF20P3
100 kDa PES	1	VF20P4
0.2 µm PES	1	VF20P7
2 kDa Hydrosart®	1	VF20H9
5 kDa Hydrosart®	1	VP20H1
10 kDa Hydrosart®	1	VF20H0
30 kDa Hydrosart®	1	VF20H2
100 kDa Hydrosart®	1	VF20H4

1.2 Related Documents

- In addition to these instructions, please observe the following documents:
- Instructions for the peristaltic pump drive
 - Instructions for the peristaltic pump head

1.3 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 product and the associated work processes. The operator understands the hazards which may arise when working with the product, and knows how to prevent them.

1.4 Symbols Used

1.4.1 Warnings in Operation Descriptions

WARNING

Denotes a hazard that may result in death or severe injury if it is **not** avoided.

NOTICE

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

1.4.2 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 macromolecules from biological and aqueous solutions. The sample solutions and volumes used must be suitable for the product.

The filtration process must be performed when the cassette(s) is connected to a peristaltic pump. The tangential flow inhibits membrane fouling. Macromolecules that are sufficiently larger than the nominal pore size of the membrane are retained in the flow path and recirculated between a sample reservoir and the cassette(s), while solvent and microsolute permeate the membrane. This process results in progressive concentration of the macromolecule of interest. With the addition of a suitable exchange buffer, the product can also be used in diafiltration mode for sample desalting or buffer exchange.

The product is supplied non-sterile. Vivaflow® 50 is intended for single use and must be disposed of after one use. Vivaflow® 50R and 200 may be used several times if recommended cleaning and storage instructions are followed.

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 research use only.

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 Qualifications of Personnel

Persons who do **not** possess adequate knowledge about how to use the product safely may injure themselves and other persons

If a particular qualification is required for an activity: The target group will be specified. If **no** qualification is specified: The activity may be carried out by the “operator” target group.

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 Personal Protective Equipment

Personal protective equipment protects against risks arising from the product. If the personal protective equipment is missing or is unsuitable for the work processes on the product: Persons may be injured.

The following personal protective equipment must be worn:

- Protective work clothing
- Safety gloves
- Safety glasses

2.5 Functionality of the Product

A **non**-functioning product, e.g., as a result of damage or wear, can cause malfunctions. There is a risk of injury to persons.

- ▶ If the product is **not** functional: Do **not** use the product.

2.6 Accessories

The use of unsuitable accessories can affect the functionality and safety of the product and have the following consequences:

- Risk of injury to persons
 - Damage, malfunctions, or failure of the product
- ▶ Only use accessories that have been approved by Sartorius and are safe for use.

3 Product Description

3.1 Vivaflow® 50

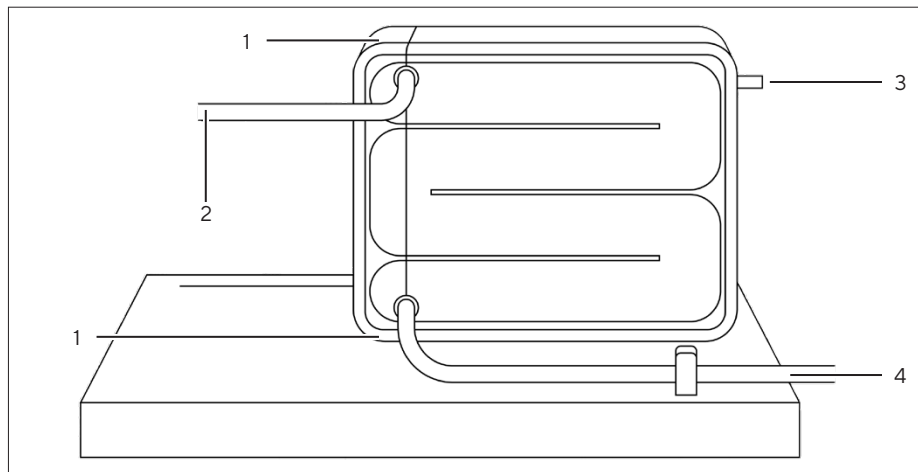


Fig.1: Product overview (example)

Pos.	Description
1	Interlock for assembly onto stand and or serial operation
2	Retentate port
3	Permeate port
4	Feed port

3.2 Vivaflow® 50R

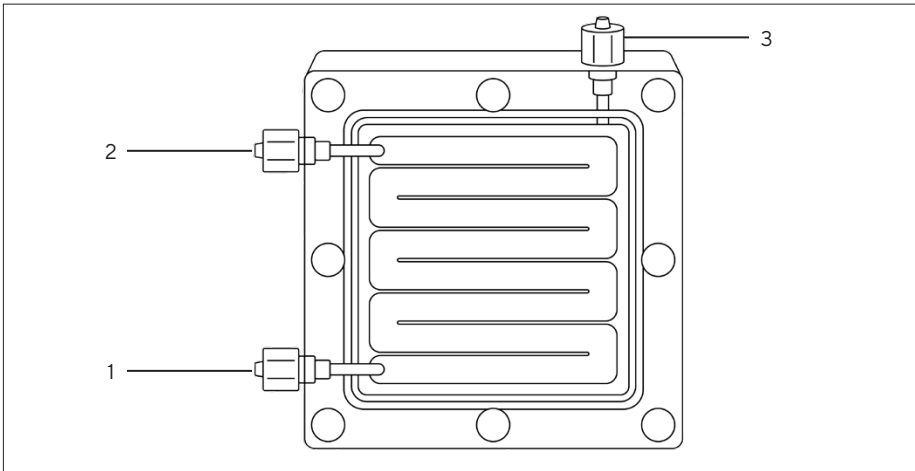


Fig. 2: Product overview (example)

Pos.	Description
1	Feed port
2	Retentate port
3	Permeate port

3.3 Vivaflow® 200

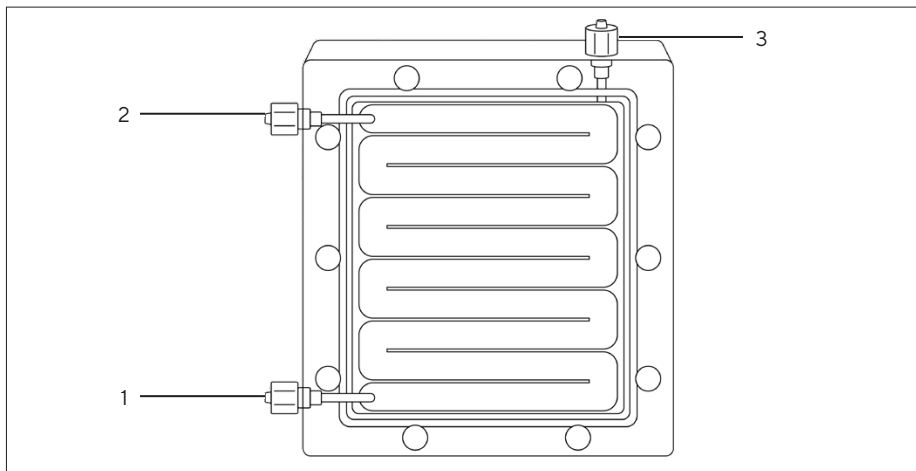









Fig. 3: Product overview (example)

Pos.	Description
1	Feed port
2	Retentate port
3	Permeate port

3.4 Product Symbols

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

4 Process Preparation

4.1 Scope of Delivery

Article	Quantity
Product packed in a cardboard box	
Vivaflow® 50	2
Vivaflow® 50R 200	1
Instructions for Use	1

4.2 Unpacking

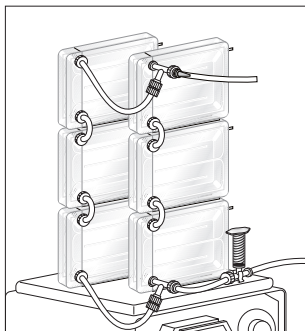
Procedure

- ▶ **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.
- ▶ Check that the packaging material is not damaged.
- ▶ Check the expiry date on the packaging label.
- ▶ Open the cardboard box.
- ▶ Remove the caps from the feed, permeate and retentate ports. Retain the caps if the product will be stored and reused (Vivaflow® 50R or 200 only), otherwise the caps can be discarded.

4.3 Connecting Vivaflow® Cassettes (optional)

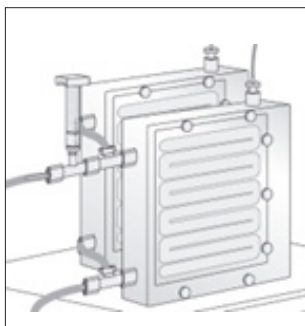
For processing larger sample volumes or for faster ultrafiltration | diafiltration, a maximum of 6X Vivaflow® 50 cassettes or 2X Vivaflow® 50R | 200 cassettes can be operated in series and | or parallel.

Procedure for Vivaflow® 50



- ▶ Slide the interlock on the base of one cassette into the interlock on the top of another cassette. Up to three cassettes can be connected in this way.
- ▶ Connect the retentate port from the lower cassette to the feed port on the cassette above, using a serial interconnector. For a stack of three cassettes, connect the retentate port from the middle cassette to the feed port of the upper cassette, using a second serial interconnector.
- ▶ To operate 2, 4, or 6 cassettes in parallel, link the feed ports on the lower cassettes and the retentate ports on the upper cassettes, using T-connectors.
- ▶ Slide the interlock on the base of the lower cassette of each stack into the cassette stand.

Procedure for Vivaflow® 50R | 200



- ▶ Link the feed ports from both cassettes, using a T-connector (Vivaflow® 50R) or a Y-connector (Vivaflow® 200).
- ▶ Link the retentate ports from both cassettes using a T-connector.

4.4 Setting Up the Cassettes for Ultrafiltration | Diafiltration

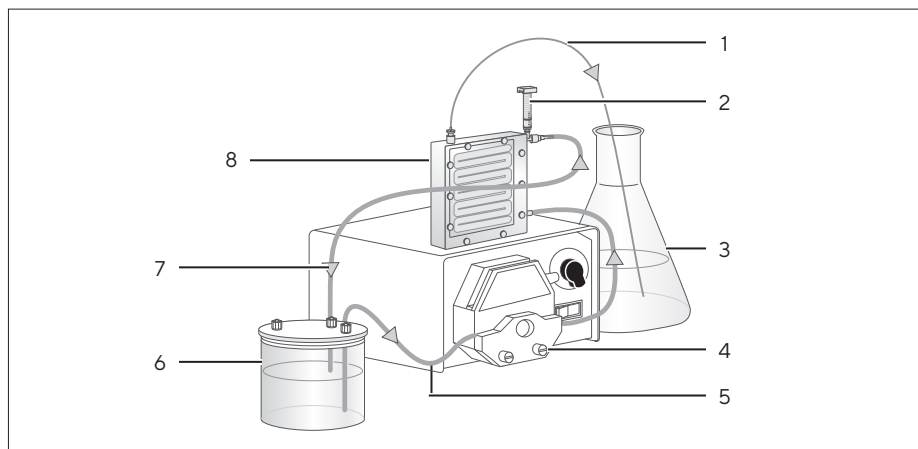


Fig. 4: Setup for ultrafiltration

Pos.	Description
1	Permeate tube
2	Pressure indicator
3	Permeate vessel
4	Peristaltic pump
5	Feed tube
6	Sample reservoir
7	Retentate tube
8	Vivaflow® cassette

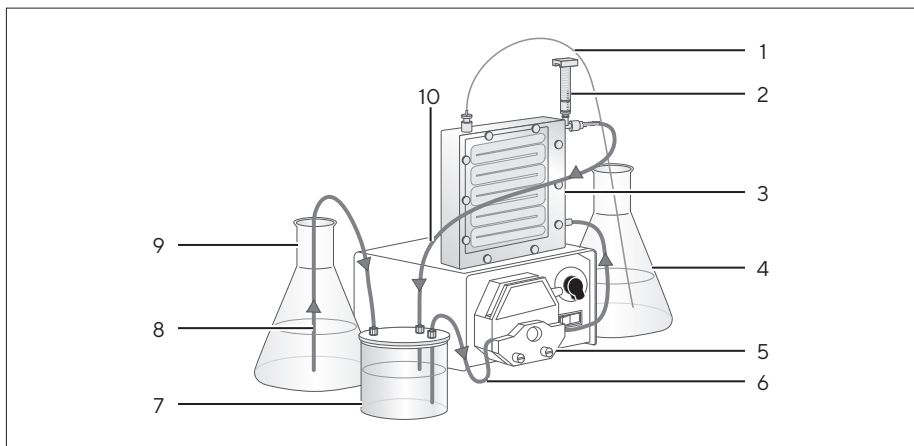


Fig. 5: Setup for diafiltration

Pos.	Description
1	Permeate tube
2	Pressure indicator
3	Vivaflow® cassette
4	Permeate vessel
5	Peristaltic pump
6	Feed tube
7	Sample reservoir
8	Exchange buffer tube
9	Exchange buffer vessel
10	Retentate tube

Procedure

- ▶ Connect the feed tube to a suitable sample vessel, e.g. sample reservoir, and to the feed port of the cassette.
 - ▶ If multiple Vivaflow® 50 cassettes will be operated in series: Connect the feed tube to the feed port of the lower cassette.
 - ▶ If multiple Vivaflow® 50 | 50R cassettes will be operated in parallel: Connect the feed tube to the T-connector that is already attached to the feed ports of the cassettes.
 - ▶ If two Vivaflow® 200 cassettes will be operated in parallel: The feed tube is not required as it is replaced by the Y-connector. Connect the other end of the Y-connector to a suitable sample vessel.
- ▶ Insert the feed tube into the peristaltic pump head.
- ▶ Connect the permeate tube(s) to the permeate port(s) and place it | them into a suitable permeate vessel, e.g. laboratory bottle.
- ▶ Connect the pressure indicator to the retentate port of the cassette.
 - ▶ If multiple Vivaflow® 50 cassettes will be operated in series: Connect the pressure indicator to the retentate port on the upper cassette.
 - ▶ If Vivaflow® 50 | 50R | 200 cassettes will be operated in parallel: Connect the pressure indicator to the T-connector that is already attached to the retentate ports of the cassettes.
- ▶ Connect the retentate tube to the pressure indicator and to the sample reservoir.

4.5 Flushing the Cassette(s) (optional)

Flushing the cassette(s) can be useful to confirm that the tubing connections are secure before starting ultrafiltration | diafiltration.

- ▶ Place 100 - 200 mL deionised water or buffer in a suitable reservoir.
- ▶ Start the peristaltic pump with a suitable flow rate (see Chapter “8.4 Operating Conditions”, page 29).
- ▷ The flushing process starts.
- ▷ The pressure indicator should read up to 2.5 bar (Vivaflow® 50) or 3.5 bar (Vivaflow® 50R | 200).
- ▶ Check the system for leaks.
- ▶ When approximately 50 - 100 mL of deionized water or buffer is in the filtrate vessel: Stop the peristaltic pump..
- ▷ The flushing process is complete.
- ▶ Empty the sample reservoir and the filtrate vessel.

5 Operation

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, it is recommended to select a MWCO that is at least 50% below the size of the target molecule.

WARNING

Risk of infection due to leakage resulting in contact with solutions!

- ▶ During the process, check the system for leaks.
 - ▶ Observe the operating conditions (Chapter “8.4 Operating Conditions”, page 29).
-

NOTICE

Risk of product malfunctions due to using unsuitable samples!

- ▶ Only apply suitable samples into the product (see Chapter “8.5 Chemical Compatibility”, page 30).
-

5.1 Performing Ultrafiltration

Procedure

- ▶ Place the solution in the sample reservoir.
- ▶ Start the peristaltic pump with a suitable flow rate (see Chapter “8.4 Operating Conditions”, page 29)
- ▷ The ultrafiltration process starts.
- ▷ The pressure indicator should read up to 2.5 bar (Vivaflow® 50) or 3.5 bar (Vivaflow® 50R | 200).
- ▶ When the desired retentate or permeate volume is reached:
 - ▶ Reduce the flow rate to 20-40 mL/min.
 - ▶ Circulate the sample for another 1-2 minutes.
- ▶ Stop the peristaltic pump.
- ▷ The ultrafiltration process is complete.

5.2 Performing Diafiltration

Procedure

- ▶ Empty the filtrate vessel.
- ▶ Fill the exchange buffer vessel, e.g. laboratory bottle, with 5x sample volumes of an appropriate exchange buffer.
- ▶ Connect exchange buffer tubing to the exchange port on the sample reservoir and place the other end to the bottom of the exchange buffer vessel.
- ▶ Start the peristaltic pump with a suitable flow rate (see Chapter “8.4 Operating Conditions”, page 29)
- ▷ The diafiltration process starts.
- ▷ The pressure indicator should read up to 2.5 bar (Vivaflow® 50) or 3.5 bar (Vivaflow® 50R | 200).
- ▶ When the required volume of exchange buffer has been added to the system and the desired retentate volume has been reached: Stop the peristaltic pump.
- ▷ The diafiltration process is complete.

5.3 Retrieving Retentate

Procedure

- ▶ Disconnect the feed tube from the sample reservoir.
- ▶ Start the peristaltic pump.
- ▷ The residual retentate in the cassette(s) and tubing is pumped back into the sample reservoir.
- ▶ Stop the peristaltic pump.
- ▶ For a more thorough recovery, perform a buffer rinse:
 - ▶ Fill 25-50 mL of water or sample buffer into a suitable vessel.
 - ▶ Place the feed tube into the vessel.
 - ▶ Start the peristaltic pump.
 - ▷ The buffer flows through the cassette(s) and tubing and is collected into the retentate, in the sample reservoir.
 - ▶ Stop the peristaltic pump.

5.4 Cleaning (Vivaflow® 50R | 200 only)

Vivaflow® 50R and 200 cassettes may be used several times if cleaning and storage instructions are followed.

Procedure

- ▶ Place the feed tube into a suitable vessel, e.g. laboratory bottle, containing deionized water.
- ▶ Place the permeate and retentate tubes into an empty vessel for waste collection.
- ▶ Start the peristaltic pump with a flow rate of 50 - 100 mL/min and flush the cassette with 200 mL water.
- ▶ Stop the peristaltic pump and place the feed, permeate and retentate tubes into a vessel containing 250 mL of cleaning solution:
 - ▶ For cassettes with PES membranes: 0.5 M NaOH, 0.5 mM NaOCl.
 - ▶ For cassettes with Hydrosart® membranes: 0.5 M NaOH.
- ▶ Start the peristaltic pump to recirculate the cleaning solution for 30-40 minutes.
- ▶ Stop the peristaltic pump, drain the system, and place the feed, permeate and retentate tubes into a vessel containing 250 mL deionized water.
- ▶ Start the peristaltic pump to recirculate the water for 5-10 minutes.
- ▶ Stop the peristaltic pump, drain the system, and place the feed tube into a vessel containing 500 mL deionized water.
- ▶ Start the peristaltic pump to flush the cassette with 500 mL of water.
- ▷ The cassette is now ready for further use.

5.5 Malfunctions

Fault	Cause	Solution
Liquids leak out of the system during flushing filtration	The tubes are not connected properly.	Check and tighten the tubing connections.
Filtration does not occur.	The wrong tube is inserted in the peristaltic pump head.	Ensure that the feed tube is inserted into the peristaltic pump head.
	The feed tube is over- or under-compressed.	Use a peristaltic pump head that is compatible with the feed tube dimensions.
Filtration does not occur.	The flow rate is too low.	If the system pressure is lower than the operating limit, increase the flow rate on the peristaltic pump.
		If the flow rate cannot be increased, check that the peristaltic pump and pump head can deliver the recommended flow rate.

6 Storage

6.1 Storing the Product

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 original packaging.
- ▶ If the product has been used (Vivaflow® 50R or 200 only):
 - ▶ Clean the cassette (see Chapter “5.4 Cleaning (Vivaflow® 50R | 200 only)”, page 23)
 - ▶ Fill the cassette with 10% ethanol.
 - ▶ Use the caps to seal the feed, permeate and retentate ports.
- ▶ Store the product according to the ambient conditions (see Chapter “6 Storage”, page 25).

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

	Vivaflow® 50	
	Unit	Value
Length x Height x Width	mm	107 x 84 x 25
Channel Width x Height	mm	15 x 0.3
Active membrane surface	cm ²	50
Min. recirculation volume	mL	< 10
Non recoverable hold-up	mL	< 0.5

	Vivaflow® 50R		Vivaflow® 200	
	Unit	Value	Unit	Value
Length x Height x Width	mm	100 x 100 x 24	mm	126 x 138 x 38
Channel Width x Height	mm	7.5 x 0.4	mm	10 x 0.4
Active membrane surface	cm ²	50	cm ²	200
Min. recirculation volume	mL	10	mL	< 20
Non recoverable hold-up	mL	< 0.5	mL	< 1

8.2 Materials

Vivaflow® 50	
Housing	Polycarbonate (PC)
Flow channel	Polymethylpentene (PMP)
Membrane support	Polymethylpentene (PMP)
Gasket	Silicone (SIL)
Fittings	Polypropylene (PP) or Polyamide (PA)
Tubing	Polyvinyl chloride (PVC)

Vivaflow® 50R 200	
Housing	Acrylic
Flow channel	Acrylic
Membrane support	Polyethylene (HDPE)
Gasket	Silicone (SIL)
Pressure indicator	Polypropylene (PP), Stainless steel (SS), Polyoxymethylene (POM), Silicone (SIL)
Fittings	Polypropylene (PP) or Polyamide (PA)
Tubing	Polyvinyl chloride (PVC)

8.3 Ambient Conditions

	Unit	Value
Storage temperature		
When packed	°C	+4 - +30
When unpacked, with membranes kept moist	°C	+4 - +8

8.4 Operating Conditions

8.4.1 Vivaflow® 50 | 50R

	Unit	Value
Throughput per cassette, recommended	mL	500
Flow rate, recommended	mL min	200 - 400
Pressure, maximum ¹		
At feed port	bar	3
At retentate port	bar	2.5
Feed tube run time, maximum	h	6
Operating temperature	°C	+4 - +60

¹ Maximum pressure for Vivaflow® 50R is 4 or 3.5 bar at the feed or retentate port, respectively.

8.4.2 Vivaflow® 200

	Unit	Value
Throughput per cassette, recommended	mL	2,500
Flow rate, recommended		
One cassette	mL min	200 - 400
Two cassettes in parallel	mL min	500 - 900
Pressure, maximum		
At feed port	bar	4
At retentate port	bar	3.5
Feed tube run time, maximum	h	6
Operating temperature	°C	+4 - +60

8.5 Chemical Compatibility

8.5.1 Vivaflow® 50

Chemical, biological and aqueous solutions with appropriate compatibility for the materials of the product (2 hr contact time)

Examples of compatible chemical solutions

Solution	PES	HY
Acetic Acid (25%)	OK	OK
Acetone	NO	NO
Ammonium hydroxide (5%)	OK	OK
Ammonium Sulphate (saturated)	OK	OK
DMEM	OK	OK
Ethanol (70%)	OK	OK

Chemical, biological and aqueous solutions with appropriate compatibility for the materials of the product (2 hr contact time)

Examples of compatible chemical solutions

Solution	PES	HY
Ethyl acetate	NO	NO
Formaldehyde (30%)	OK	OK
Formic acid (5%)	OK	OK
Guanidine HCl (6 M)	OK	OK
Hydrocarbons, aromatic	NO	?
Hydrocarbons, chlorinated	NO	NO
Hydrochloric Acid (1 M)	OK	NO
Isopropanol (70%)	NO	NO
Lactic Acid (5%)	OK	OK
Mercaptoethanol (10 mM)	OK	OK
Methanol (60%)	OK	OK
n-Butanol (70%)	OK	OK
Peracetic acid (0.2%)	OK	OK
Phenol (1%)	OK	?
Phosphate Buffer (1 M)	OK	OK
Pyridine	NO	NO
RPMI-1640	OK	OK
Sodium azide	OK	OK
Sodium Deoxycholate (5%)	OK	OK
Sodium Hydroxide (1 M)	NO	NO
Sodium Hydroxide (0.1 M)	NO	NO

Chemical, biological and aqueous solutions with appropriate compatibility for the materials of the product (2 hr contact time)

Examples of compatible chemical solutions

Solution	PES	HY
Sodium Hypochlorite (0.02%)	?	?
Sodium Nitrate (1%)	NO	NO
Sulfamic Acid (5%)	OK	NO
Surfactants (0.1%)	OK	OK
Toluene	NO	NO
Trichloroacetic Acid (10%)	NO	?
Trifluoroacetic Acid (10%)	OK	NO
Urea (8 M)	OK	OK

OK = Acceptable

? = Questionable

NO = Not recommended

8.5.2 Vivaflow® 50R | 200

Chemical, biological and aqueous solutions with appropriate compatibility for the materials of the product (2 hr contact time)

Examples of compatible chemical solutions

Solution	PES	HY
Acetic Acid (25%)	OK	OK
Acetone	NO	NO
Ammonium hydroxide (5%)	OK	OK
Ammonium Sulphate (saturated)	OK	?
DMEM	OK	OK
Ethanol (70%)	OK	OK
Ethyl acetate	NO	NO
Formaldehyde (30%)	OK	OK
Formic acid (5%)	OK	OK
Guanidine HCl (6 M)	OK	OK
Hydrocarbons, aromatic	NO	NO
Hydrocarbons, chlorinated	NO	NO
Hydrochloric Acid (1 M)	OK	OK
Isopropanol (70%)	NO	NO
Lactic Acid (5%)	OK	OK
Mercaptoethanol (10 mM)	OK	OK
Methanol (60%)	OK	OK
n-Butanol (70%)	OK	OK
Peracetic acid (0.2%)	OK	NO
Phenol (1%)	OK	NO

Chemical, biological and aqueous solutions with appropriate compatibility for the materials of the product (2 hr contact time)

Examples of compatible chemical solutions

Solution	PES	HY
Phosphate Buffer (1 M)	OK	OK
Pyridine	NO	NO
RPMI-1640	OK	OK
Sodium azide	OK	OK
Sodium Deoxycholate (5%)	OK	?
Sodium Hydroxide (1 M)	OK	OK
Sodium Hydroxide (0.1 M)	OK	OK
Sodium Hypochlorite (0.02%)	OK	NO
Sodium Nitrate (1%)	NO	OK
Sulfamic Acid (5%)	OK	?
Surfactants (0.1%)	OK	OK
Toluene	NO	NO
Trichloroacetic Acid (10%)	NO	OK
Trifluoroacetic Acid (10%)	OK	OK
Urea (8 M)	OK	OK

OK = Acceptable

? = Questionable

NO = Not recommended

8.6 Typical Performance Characteristics

8.6.1 Vivaflow® 50

Time to concentrate 20x (min.) at 3 bar feed pressure, 20°C				
	Single Device	Three Devices	Solute Recovery	
	250 mL Start volume	1 L Start volume	Direct	10 mL rinse
BSA 1 mg/mL (66 kDa MW)				
5 kDa PES	34	49	96%	> 99%
10 kDa PES	22	32	94%	> 99%
30 kDa PES	22	32	92%	99%
50 kDa PES	20	29	92%	98%
γ Globulins 1 mg/mL (150 kDa MW)				
100 kDa PES	43	62	92%	98%
Yeast 1 mg/mL (<i>S. cerevisiae</i>)				
0.2 μm PES	33	47	92%	98%

8.6.2 Vivaflow® 50R

Time to concentrate 20x (min.) at 3 bar inlet 2.5 bar outlet pressure, 20°C				
	Start volume	Average flux	Solute Recovery	
	250 mL	mL min	Direct	25 mL rinse
Lysozyme 0.25 mg/mL (14 kDa MW)				
5 kDa Hydrosart	70	3.4	96%	98%
10 kDa Hydrosart	23	10.3	94%	96%
BSA 1 mg/mL (66 kDa MW)				
10 kDa Hydrosart	24	9.9	98%	> 99%
30 kDa Hydrosart	15	15.8	97%	> 99%
γ Globulins 1 mg/mL (150 kDa MW)				
100 kDa Hydro-sart	46	5.2	97%	> 99%
Start volume 1 L (one Vivaflow 50R) 10 kDa Hydrosart				
BSA 1 mg/mL	95	10.0	98%	> 99%
Start volume 1 L (two Vivaflow 50R in parallel) 10 kDa Hydrosart				
BSA 1 mg/mL	48	19.8	98%	> 99%

8.6.3 Vivaflow® 200

	Time to concentrate 20x (min.) at 3 bar inlet, 20°C			
	Start volume	Average flux	Solute Recovery	
	1 L	mL min	Direct	25 mL rinse
Lysozyme 0.25 mg/mL (14 kDa MW)				
2 kDa Hydrosart	160	6	97%	> 99%
3 kDa PES	180	5	97%	> 99%
BSA 1 mg/mL (66 kDa MW)				
5 kDa PES	29	33	98%	> 99%
5 kDa Hydrosart	70	14	98%	> 99%
10 kDa PES	23	41	96%	> 99%
10 kDa Hydrosart	35	27	98%	> 99%
30 kDa PES	25	38	96%	99%
30 kDa Hydrosart	20	48	96%	> 99%
50 kDa PES	22	43	96%	98%
γ Globulins 1 mg/mL (160 kDa MW)				
100 kDa PES	54	18	96%	99%
100 kDa Hydrosart	45	21	96%	99%
Yeast 1 mg/mL (<i>S. cerevisiae</i>)				
0.2 μm PES	11	86	92%	98%

Time to concentrate 20x (min.) at 3 bar inlet, 20°C				
	Start volume	Average flux	Solute Recovery	
	1 L	mL min	Direct	25 mL rinse
Dilute solute in 1 L start volume, 10 kDa PES				
BSA 0.001 mg/mL	18	52	90%	98%
BSA 0.01 mg/mL	20	47	92%	98%
BSA 0.1 mg/mL	21	45	94%	99%
Start volume 5 L (two Vivaflow 200 in parallel) 10 kDa PES				
BSA 1.0 mg/mL	67	70	97%	> 99%

9 Accessories

Accessories	Quantity	Prod. no.
Peristaltic Pump Drive	1	VF-APD0001-1
Peristaltic Pump Head, 1.6 mm Tubing	1	VF-APH0001-1
Peristaltic Pump Head, 2.4 mm Tubing	1	VF-APH0002-1
Cassette Stand	1	VFA016
Sample Reservoir	1	VFA006
Pressure Indicator	1	VFA020
Y-connector	1	VFA005
T-connector	2	VFA030
Replacement Tubing Kit	1	VFA034

Sartorius Stedim Lab Ltd.
Sperry Way, Stonehouse
GL10 3UT, UK

Phone: +44 1453 821972
www.sartorius.com

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

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