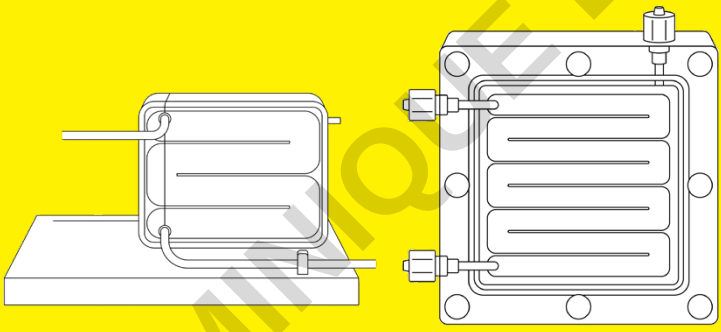
Instructions for Use

# Vivaflow® 50 | 50R | 200

TFF Cassettes for Research Use Only



DOMINIQUE DUTSCHER

3104678-001-00

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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, retenate 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, retenate tubing and pressure indicator | | |
| 3 kDa PES | 1 | VF20P9 |

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| 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. |

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## 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.

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# 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 microsolutes 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.

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## 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.

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## 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.

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# 3 Product Description

## 3.1 Vivaflow® 50

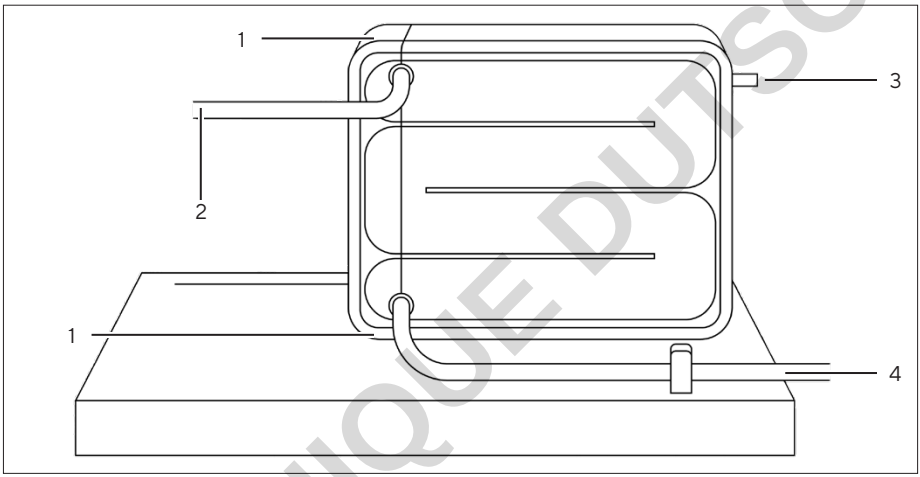



Fig. 1: Product overview (example)

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

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## 3.2 Vivaflow® 50R

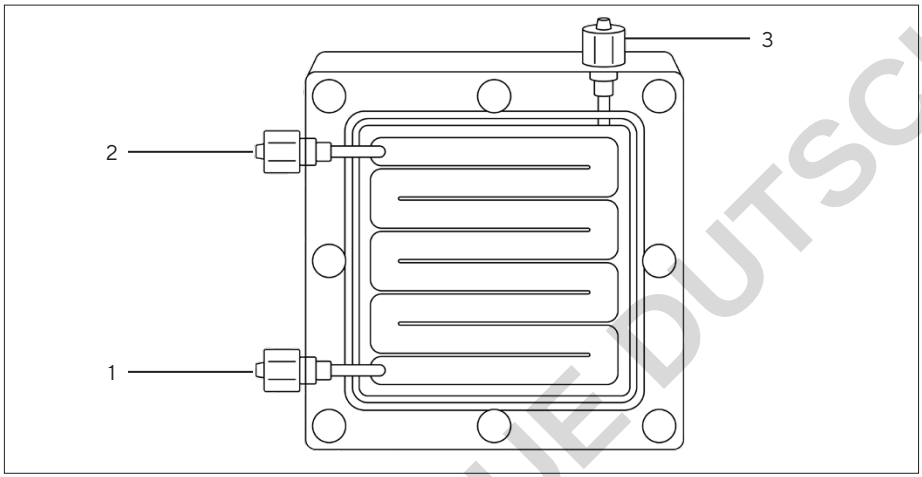



Fig. 2: Product overview (example)

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

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## 3.3 Vivaflow® 200

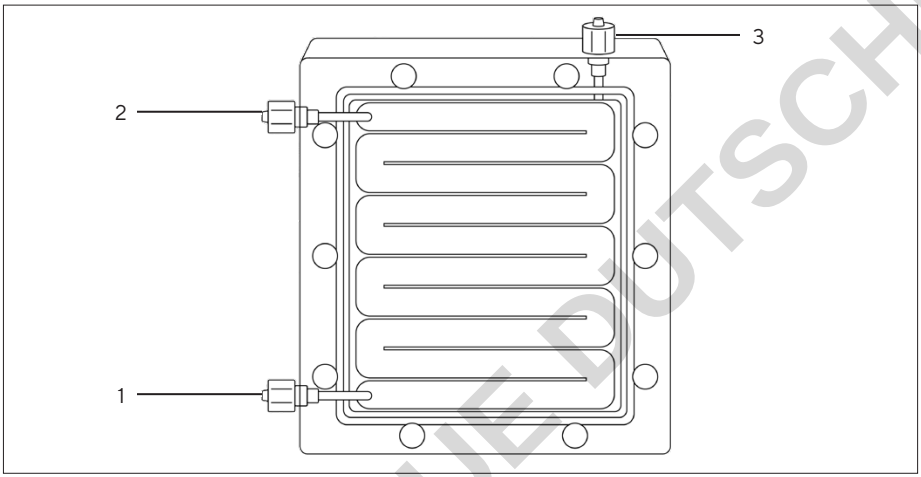



Fig. 3: Product overview (example)

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

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## 3.4 Product Symbols

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

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# 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**

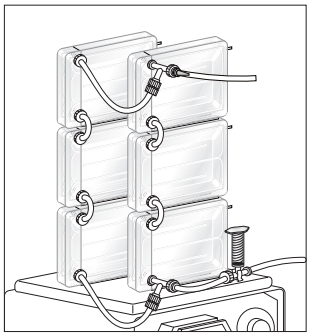
- ▶ **NOTICE** Risk of product malfunctions due to exceeding the usability! Check the usability of the product (see specification on packaging). Dispose of products for which the usability has been exceeded.
- ▶ Check that the packaging material is not damaged.
- ▶ Check the expiry date on the packaging label.
- ▶ Open the cardbord 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.

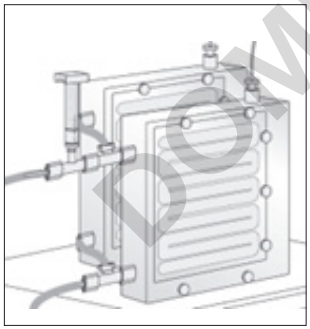
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### Procedure for Vivaflow® 50



- 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.

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## 4.4 Setting Up the Cassettes for Ultrafiltration | Diafiltration

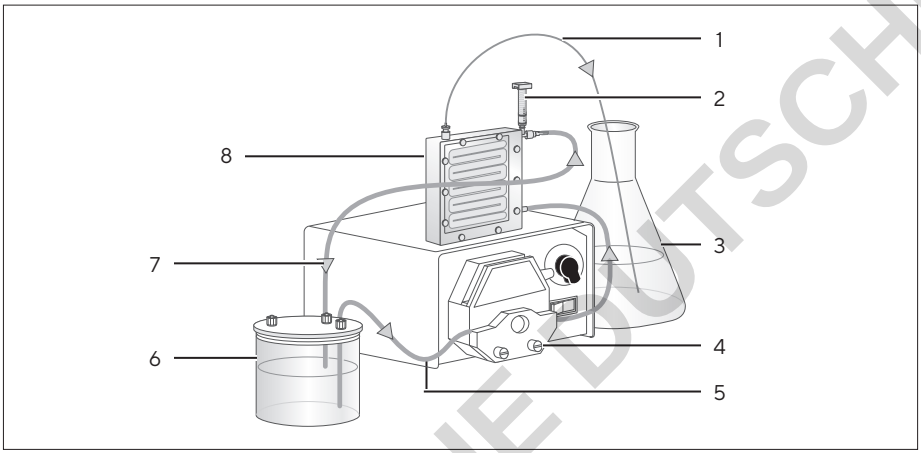



Fig. 4: Setup for ultrafiltration

| 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 |

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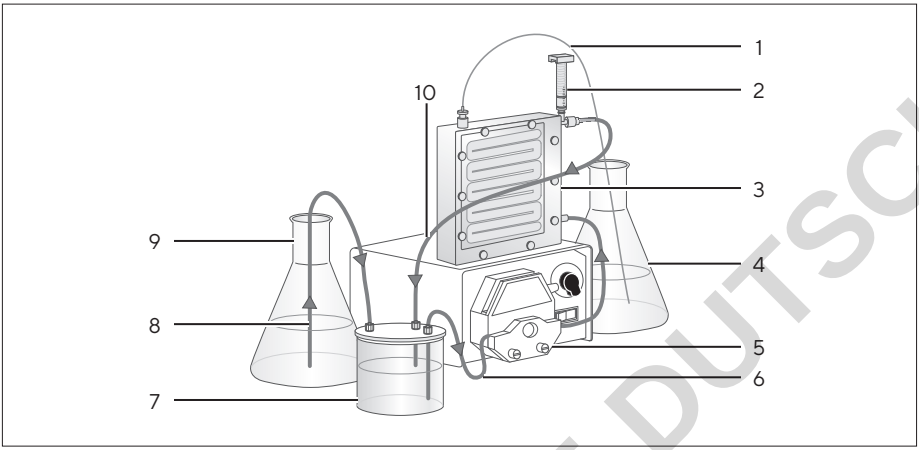



Fig. 5: Setup for diafiltration

| 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 |

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### 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 retenate ports of the cassettes.
- Connect the retentate tube to the pressure indicator and to the sample reservoir.

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## 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.

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# 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.

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## 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.

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## 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.

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## 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. |

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# 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).

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# 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.

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# 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 |

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## 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),<br>Stainless steel (SS),<br>Polyoxymethylene (POM),<br>Silicone (SIL) |
| Fittings | Polypropylene (PP) or Polyamide (PA) |
| Tubing | Polyvinyl chloride (PVC) |

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## 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.

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### 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 |

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| 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 |

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| 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 recommanded

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### 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 |

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| 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 recommanded

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## 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 (*S. cerevisiae*) | | | | |
| 0.2 µm PES | 33 | 47 | 92% | 98% |

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### 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% |

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### 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 (*S. cerevisiae*) | | | | |
| 0.2 µm PES | 11 | 86 | 92% | 98% |

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| | 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% |

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# 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 |

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