

Vivascience Vivaflow 200

Vivaflow 200 is a novel (patent pending) tangential flow module that offers significantly faster concentration performance with less hold up than comparable devices. This is achieved by the use of a unique “flip-flow” thin channel flow path that combines greatly increased cross-flow turbulence with unusually low pump requirements.

One litre can typically be concentrated up to 50 times in less than thirty minutes. For faster filtration or for processing volumes of five litres or more, two modules may be linked in parallel, achieving filtration rates comparable to systems with much larger membrane areas and flow requirements. Two modules running off a single size 15 peristaltic tube will typically concentrate 5 litres in less than 90 minutes.

Choosing the most appropriate membrane

Vivascience offers high performance Polyethersulfone, Regenerated Cellulose and Hydrosart membrane alternatives, giving a combination of high flux and low protein binding with very low levels of non-specific adsorption.

Polyethersulfone membranes exhibit no hydrophobic or hydrophilic interactions and are usually preferred for their low fouling characteristics, broad pH range, and durability. A range of cut offs is available from 5,000 MWCO to 0.2 μm .

Regenerated Cellulose membranes are hydrophilic and are usually preferred for their high selectivity and ease of cleaning. 10,000, 30,000, and 100,000 MWCO are available.

Hydrosart is a stabilised cellulose based membrane that has been optimised for the biotechnological industry. The Hydrosart membrane is a stable polymer that features a broad pH range. Hydrosart is also extremely hydrophilic, making it non-protein binding, virtually non-foul, and has extremely high flux. Hydrosart is available in 5k, 10k, and 30k molecular weight cutoffs.



For maximum retention, select a membrane cut-off that is at least 50 % lower than the molecular weight of the species of interest.

Equipment Supplied

- Vivaflow 200 filtration module
- Pressure indicator
- 1 m size 16 PVC tubing with luer inlet fitting
- 1 m size 16 PVC tubing with 0.6 mm flow restrictor
- 1 m PVC filtrate tubing with luer fitting

Equipment Required

a. Single module

1. Peristaltic pump-head accepting size 16 tubing, delivering 480 ml/min. (VFA012 or equivalent), and a variable speed peristaltic pump capable of providing this flow rate. (VFP001 or equivalent). It is also possible to use a pump head that runs larger size 15 tubing. (See optional equipment).
2. Suitable containers for the sample and filtrate.

b. Two modules

1. Peristaltic pump-head accepting size 15 tubing delivering 1000 ml/min, (VFA013 or equivalent) and a variable speed peristaltic pump capable of providing this flow rate. (VFP001 or equivalent)

2. Size 15 PVC peristaltic tubing with luer fittings (VFA003).
3. Y connector (VFA005).
4. Suitable containers for the sample and filtrate.

Optional Equipment

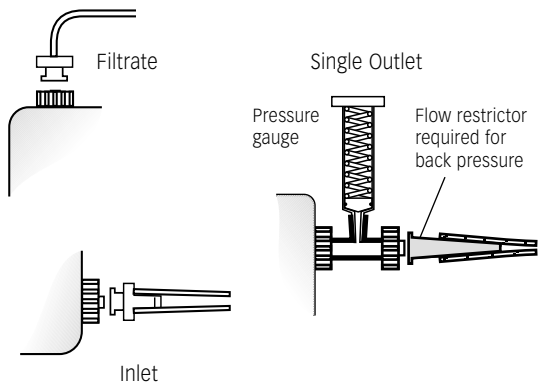
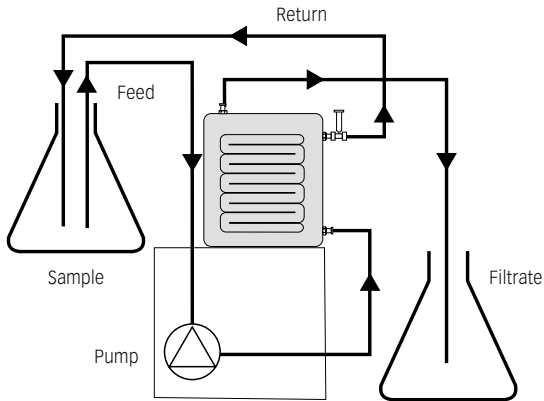
- Where faster cross-flow velocities are required, it is possible to run one module with size 15 tubing (VFA003), the corresponding pump-head (VFA013), and a 0.8 mm flow restrictor (VFA009).
- For concentration/diafiltration of small volumes, the 500 ml sample reservoir (VFA006) is recommended.

Set up of Vivaflow 200

Vivascience recommends standing the module vertically on the pump housing as this orientation usually allows the use of shorter recirculation tubing and the elimination of any residual air in the system.

Alternatively, the module can be positioned either vertically or horizontally on any flat surface. Connect system according to one of the options illustrated below. Run tubing through pump head according to pump manufacturers instructions.

**Operation
Single Module**



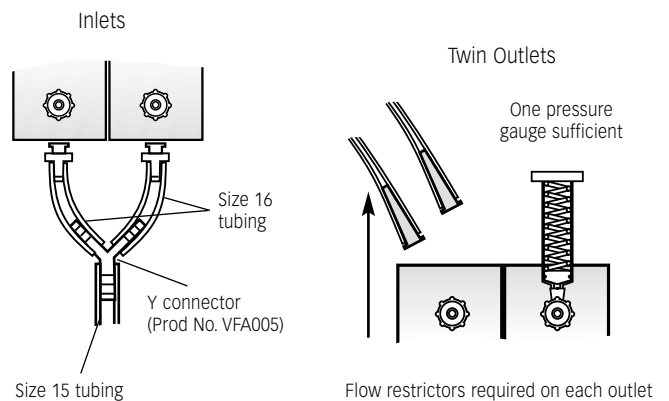
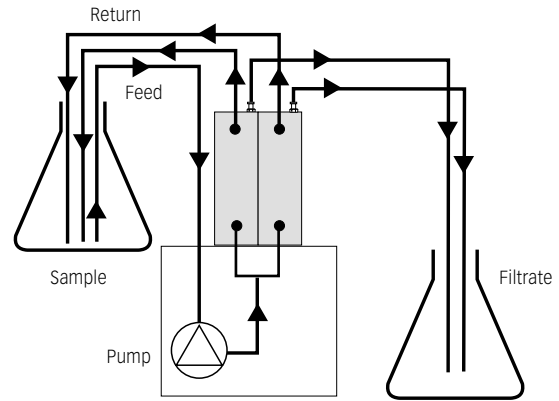
Assembly and rinsing Single module

1. Set up the system as illustrated above. Note the positioning of the flow restrictor on the return line. A set of flow restrictors of different gauges, (Product No. VFA009) is available for use with solutions of unusually high or low viscosity.

⚠ WARNING Ensure Luer connections are secure before operation.

2. Vivaflow membranes contain trace amounts of glycerine and sodium azide. To remove these chemicals and to check the security of the tube connections, it is recommended to rinse the module, and to test the system at full pressure before introducing the sample.
3. Place 500 ml deionised water in a suitable reservoir.
4. Pump liquid through the system to purge any air pockets. The recirculation rate should be 200-400 ml/min, and suitable flow should exit the filtrate line. If used, the pressure indicator should read approximately 2.5 bar.
5. Allow 400 ml to pass into the filtrate vessel. Check for any leakage at tubing connection points.
6. Drain the system and empty or replace the filtrate vessel, (see Recovery section). The system is now ready for use.

Two Modules



Assembly and rinsing two modules

1. Set up the system as illustrated above.

⚠ WARNING Ensure Luer connections are secure before operation.

2. Use the Y-connector, (VFA005), two 12 cm sections of size 16 tubing and two female Luer fittings to connect to the inlets of both modules.
3. Note the positioning of a flow restrictor on the return line from each module. Vivaflow membranes contain trace amounts of glycerine and sodium azide. To remove these chemicals and to check the security of the tube connections, it is recommended to rinse the module, and to test the system at full pressure before introducing the sample.
4. Place 1 litre of deionised water in a suitable reservoir.
5. Pump liquid through the system to purge any air pockets. The recirculation rate should be 500-900 ml/min, and suitable flow should exit the filtrate line. If used, the pressure indicator should read approximately 2.5 bar.
6. Allow 800 ml to pass into the filtrate vessel. Check for any leakage at tubing connection points.
7. Drain the system and empty or replace the filtrate vessel, (see Recovery section). The system is now ready for use.

Diafiltration / Desalting

1. Set up the system as illustrated.
2. Rinse the system as detailed previously.
3. Place the solution to be purified in a suitable diafiltration reservoir. For volumes up to 500 ml the Vivaflow 500 ml sample/diafiltration reservoir, (VFA006), is recommended. Ensure the lid is firmly closed.
4. Fill the large feed reservoir with exchange solvent and pump sample through the system as for concentration.
5. As liquid passes through the membrane, the vacuum created in the diafiltration reservoir draws in exchange solvent through the feed line from the large reservoir. Over 99 % solvent exchange can be accomplished with an exchange volume of approximately 5 times the sample volume.

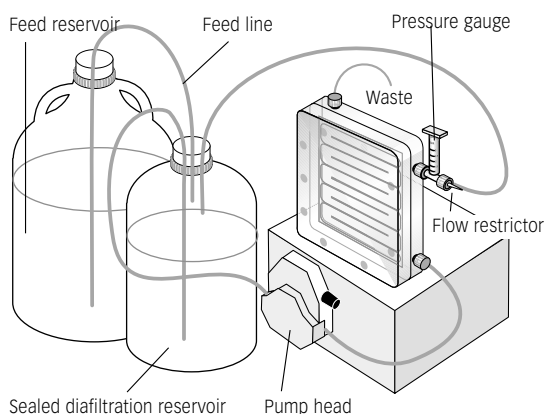


Table 1: Technical Specifications

Specifications	
Active Membrane Area	200 cm ²
Hold up Volume (module)	5.3 ml
Min. Recirculation Volume	< 20 ml
Non Recoverable Hold-up	< 2 ml
Materials	
Main Housing	Acrylic
Membrane Support	Polypropylene
Seals and O Rings	Silicone
Pressure Gauge	Polypropylene, SS Spring
Flow Restrictor	Polypropylene
Fittings	Nylon
Tubing	PVC (medical grade)
Dimensions	
Overall L/H/W	126/138/38 mm
Channel W/H	10 mm/0.4 mm
Operating Conditions	
Pump Flow	200-400 ml/min
Maximum Pressure	4 bar (60 psi)

Concentration

1. Fill the feed reservoir with sample solution.
2. Pump liquid through the system. The recirculation rate should be 200-400 ml/min, (500-900 ml/min for two modules), and suitable flow should exit the filtrate line. If used, the pressure indicator should read approximately 2.5 bar.

WARNING: Do not run the same section of tubing through the pump-head for longer than 6 hours, overuse of tubing will result in significant pressure drop and ultimately, failure).

3. Concentrate the sample.
4. When nearing the desired volume, reduce the recirculation rate to 20-40 ml/min and recirculate the concentrated sample for 1-2 minutes to increase sample recovery.

Recovery

1. Remove the feed line from the sample.
2. Pump residual system volume back into the reservoir/container.
3. For a more complete recovery, rinse 25-50 ml of water or sample buffer through the system, and recover as before.

Cleaning

Vivaflow 200 modules may be used several times if cleaning and storage instructions are followed.

1. Flush the system with 200 ml of deionised water with the filtrate going to waste.
2. Place the feed, return and filtrate lines in a suitable container for the cleaning solution.
3. Prepare cleaning solutions suitable for the membrane.
 - I. Polyethersulfone membranes: 250 ml of 0.5 mM NaOCl in 0.5 M NaOH
 - II. Regenerated cellulose membranes: 250 ml of 0.1 M NaOH
 - III. Hydrosart membranes: 250 ml of 0.5 M NaOH
4. Recirculate at 50-100 ml/min for 30-40 minutes.
5. Drain the system and recirculate 250 ml of deionised water through the system for 5-10 minutes.
6. Drain and discard rinse solution and flush with a further 500 ml of deionised water with the filtrate going to waste. The system is now ready for further use.

Storage

To store Vivaflow 200 after cleaning, fill module with deionised water and 10 % ethanol. Seal inlet, outlet and filtrate ports and refrigerate at approximately 4°C.

Table 2: Performance Characteristics

Start Volume 1 litre at 3 bar inlet pressure at 20° C	20X Conc. minutes	Average Flux ml/min	Recovery %	
			Direct	25 ml rinse
BSA 1.0 mg/ml (66,000 MW)				
5,000 MWCO PES	29	33	98 %	> 99 %
5,000 MWCO HYDROSART	70	14	98 %	> 99 %
10,000 MWCO PES	23	41	96 %	> 99 %
10,000 MWCO RC	42	23	97 %	> 99 %
10,000 MWCO HYDROSART	35	27	98 %	> 99 %
30,000 MWCO PES	25	38	96 %	99 %
30,000 MWCO RC	22	43	96 %	99 %
30,000 MWCO HYDROSART	20	48	96 %	> 99 %
50,000 MWCO PES	22	43	96 %	98 %
γ Globulins 1.0 mg/ml (Average 160,000 MW)				
100,000 MWCO PES	54	18	96 %	99 %
100,000 MWCO RC	45	21	96 %	99 %
Yeast 1.0 mg/ml (S.Cerevisiae)				
0.2 μm PES	11	86	92 %	98 %
Dilute Solute Concentration Start Volume 1 litre at 3 bar, 10,000 MWCO 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 liters (Two VF200 in parallel at 3 bar) 10,000 MWCO PES				
BSA 1.0 mg/ml (66,000 MW)	67	70	97 %	> 99 %

Table 3: Chemical Compatibility

Solution	PES	RC	HY	Solution	PES	RC	HY
Acetic acid (25 %)	OK	OK	OK	Peracetic acid (0.2 %)	OK	OK	NO
Acetone	NO	NO	NO	Phenol (1 %)	OK	?	NO
Ammonium hydroxide (5 %)	OK	OK	OK	Phosphate Buffer (1 M)	OK	OK	OK
Ammonium sulfate sat.	OK	OK	?	Pyridine	NO	NO	NO
DMEM	OK	OK	OK	RPMI-1640	OK	OK	OK
Ethanol (70 %)	OK	OK	OK	Sodium azide	OK	OK	OK
Ethyl acetate	NO	NO	NO	Sodium deoxycholate (5 %)	OK	OK	?
Formaldehyde (30 %)	OK	OK	OK	Sodium hydroxide (1 M)	OK	NO	OK
Formic acid (5 %)	OK	OK	OK	Sodium hydroxide (0.1 M)	OK	OK	OK
Guanidine HCl (6 M)	OK	OK	OK	Sodium hypochlorite (0.02 %)	OK	?	NO
Hydrocarbons, Aromatic	NO	?	NO	Sodium nitrate	NO	NO	OK
Hydrocarbons, Chlorinated	NO	NO	NO	Sulfamic acid (5 %)	OK	NO	?
Hydrochloric acid (1 M)	OK	NO	OK	Surfactants (0.1 %)	OK	OK	OK
Isopropanol	NO	NO	NO	Toluene	NO	NO	NO
Lactic acid (5 %)	OK	OK	OK	Trichloroacetic acid (10 %)	NO	?	OK
Mercaptoethanol (10 mM)	OK	OK	OK	Trifluoroacetic acid (10 %)	OK	NO	OK
Methanol (60 %)	OK	OK	OK	Urea (8 M)	OK	OK	OK
n-Butanol (70 %)	OK	OK	OK				

OK = Acceptable ? = Questionable NO = Not recommended

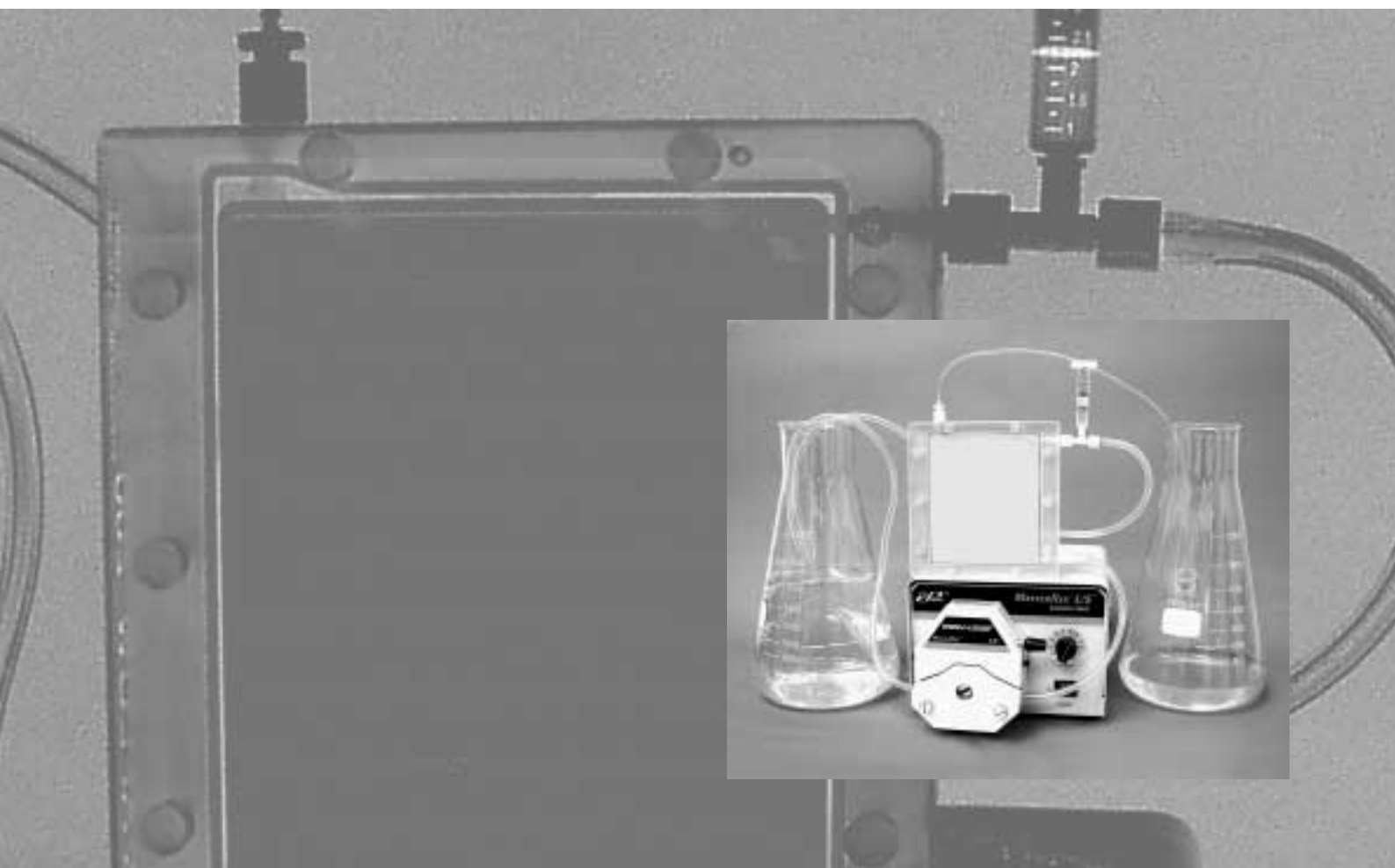
Ordering Information		
VivaFlow 200 Includes pressure indicator, flow restrictor and size 16 pvc peristaltic tubing and fittings		
	Pack Size	Prod. No.
5,000 MWCO (PES)	1	VF20P1
10,000 MWCO (PES)	1	VF20P0
30,000 MWCO (PES)	1	VF20P2
50,000 MWCO (PES)	1	VF20P3
100,000 MWCO (PES)	1	VF20P4
0.2 µm (PES)	1	VF20P7
10,000 MWCO (RC)	1	VF20C0
30,000 MWCO (RC)	1	VF20C2
100,000 MWCO (RC)	1	VF20C4
5,000 MWCO (Hydrosart)	1	VF20H1
10,000 MWCO (Hydrosart)	1	VF20H0
30,000 MWCO (Hydrosart)	1	VF20H2
VivaFlow 200 Accessories		
Masterflex Economy Drive Variable Speed Peristaltic Pump (CE 230V - US 115V)		VFP001
Masterflex Easy Load Pump Head - Size 16		VFA012
Masterflex Easy Load Pump Head - Size 15		VFA013
500 ml Sample and/or Diafiltration Reservoir		VFA006
VivaFlow 200 Tubing and Fittings		
Size 16 pvc pump tubing and Luer fittings (3 mtrs)		VFA004
Size 15 pvc pump tubing and Luer fittings (3 mtrs)		VFA003
Y Connector (size 15 to 2 X size 16)		VFA005
Flow restrictor set (2 X 0.4, 0.6, 0.8 mm)		VFA009
Female Luer Fittings size 15 (10 pieces)		VFA036
Female Luer Fittings size 16 (10 pieces)		VFA032
Flow restrictors (0.6 mm) (6 pieces)		VFA035

Vivascience Technical Support		Phone	Fax	E-mail
USA	Vivascience Service & Technical Support	+1 877 452 2345 (toll free)	+1 631 254 4253	info.usa@vivascience.com
Europe	Vivascience Support Center	+49 1 802 000 581 (toll free)	+49 1 802 000 583	info@sc.vivascience.com
International	Vivascience Support Center	+49 551 38906 0	+49 551 38906 11	info@sc.vivascience.com
Vivascience Customer Sales				
France	Vivascience S.A.R.L.	+33 169 19 93 23	+33 160 13 95 05	info.france@vivascience.com
Germany	Vivascience AG	+49 551 308 4023	+49 551 308 3289	info.germany@vivascience.com
UK	Vivascience Ltd.	+44 1372 737 159	+44 1372 726 171	info.uk@vivascience.com
USA	Vivascience Inc.	+1 877 452 2345	+1 760 918 8281	info.usa@vivascience.com

Vivascience AG

Feodor-Lynen-Strasse 21 Phone: +49 511 524875-0 E-mail: info@vivascience.com
30625 Hannover, Germany Fax: +49 511 524875-19 Web: www.vivascience.com

VIVASCIENCE



Vivaflow 200

Technical data and operating instructions.
For in vitro use only.
