

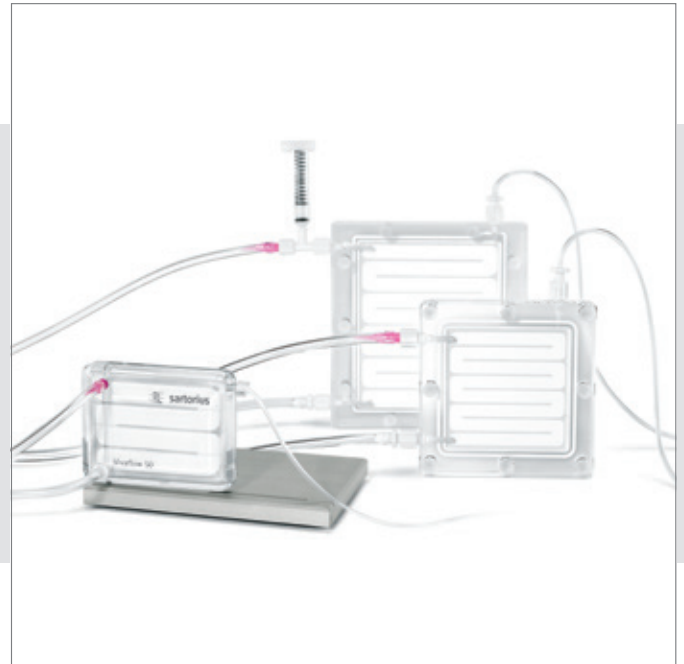


Vivaflow[®] 50 | 50R | 200

Unique, "Plug & Play" Laboratory
Crossflow Devices

Benefits

- Easy to Operate Using a Standard Pump
- Unique Volume Range from 0.1 l to 5 l
- Fast Concentration
- High Recoveries



Product Information

Vivaflow[®] crossflow devices have been designed for use in research and are ideal for concentration and diafiltration of aqueous samples with volumes ranging from 100 ml to 5 l. They achieve concentrations of 10-fold to 50 fold, depending on the initial sample volume.

Plug and Play Convenience

The clear Vivaflow[®] housing allows visual monitoring of the sample at all times. The devices are easy to set up and need only a standard peristaltic pump to operate.

Our Vivaflow[®] range offers the right crossflow device for every concentration need:

Vivaflow[®] 50 is a disposable, modular crossflow device, which can be easily scaled up to 6 units that run both in parallel and in series. Designed as unique interlocking modules, the units are conveniently connected in the required number on an aluminum stand according to the scaleup level required. Vivaflow[®] 50 saves regeneration time and is the economical choice for concentration and buffer exchange of 0.1 ml to 3 l samples containing proteins, viruses and nanoparticles.

Vivaflow[®] 50R is a reusable crossflow device featuring a unique, low-binding regenerated cellulose membrane, Hydrosart[®]. Therefore, it is the ideal choice for concentrating expensive samples like viruses and antibodies. Vivaflow[®] 50R can be scaled up with one additional unit to increase the flow speed for concentrating initial sample volumes of up to 1 l.

Vivaflow[®] 200, like Vivaflow[®] 50R, is a reusable crossflow device, but is available in a choice of membranes: Hydrosart[®] and PES. This device is perfect for concentrating expensive samples like viruses and antibodies. Vivaflow[®] 200 can be scaled up with one additional unit to increase the flow speed for concentrating initial sample volumes of up to 5 l.

Applications

Vivaflow[®] devices lend themselves to a multitude of different concentration applications whenever larger volumes of sample need to be concentrated in a lab environment.

Typical applications and areas of use include the following:

- Antibody | recombinant protein concentration | diafiltration in biopharma research
- Concentration of small production lots of proteins for diagnostic purposes
- Concentration of viruses from cell culture supernatants or of environmental samples
- Nanoparticle concentration

Vivaflow[®] Working Principle

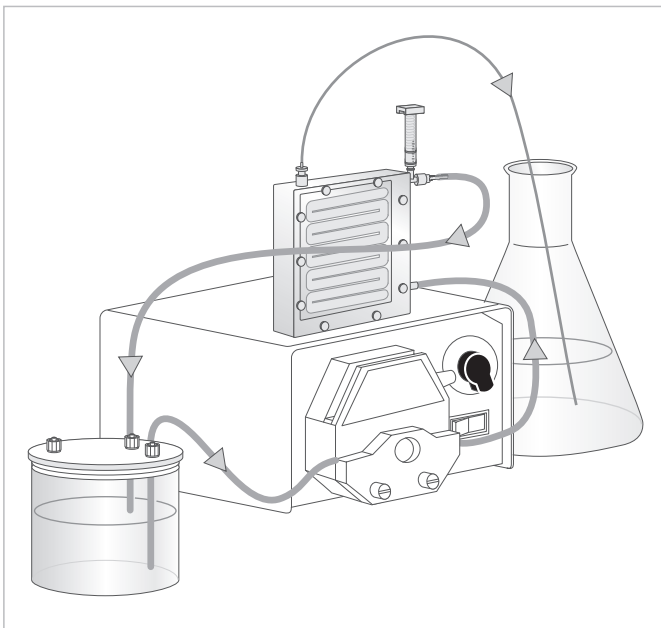


Diagram 1: Operating Vivaflow[®] cassettes

Guide to Selecting the Right Vivaflow[®] Device

Sample Volume [l]	Vivaflow [®] 50 No. of Units	Vivaflow [®] 50R No. of Units	Vivaflow [®] 200 No. of Units
0.1 – 0.25	1	1	NR
0.25 – 0.5	1 – 2	1 – 2	NR
0.5 – 1	2	2	1
1 – 2	3 – 4	NR	1
2 – 3	4 – 6	NR	2
3 – 4	NR	NR	2
4 – 5	NR	NR	2

NR: Not Recommended

Table 1: Overview of the optimal operating volumes for the various Vivaflow[®] systems

Summary

Sartorius offers a complete range of Vivaflow[®] crossflow devices for scientists and lab technicians who need to reliably concentrate or rebuffer and | or diafilter aqueous samples with initial volumes of up to 5 l. Unlike other crossflow cassettes on the market, Vivaflow[®] is a dedicated laboratory product that meets the demand for ease of use without requiring any additional non-standard instrumentation. Just a standard laboratory peristaltic pump is all that is needed to operate Vivaflow[®] units.

Vivaflow[®] cassettes are crossflow devices that contain an ultrafiltration membrane and are operated by using a standard peristaltic pump to recirculate a sample through them. The thin-channel, flip-flow recirculation path geometry of all Vivaflow[®] modules provides high crossflow velocities with minimum pump speed requirements of 200 – 400 ml/min. A special flow restrictor at the outlet tubing readily generates back pressure in each cassette, resulting in the concentration of the sample and separation of sample constituents as the sample flows across the membrane. While the sample is recirculated by the pump, the filtrate is collected in a separate vessel. Concentration can be stopped anytime the desired volume is achieved.

A single 50 cm² module typically reduces 500 ml to 15 ml in less than 50 min. Virtually total recovery of the concentrate is achieved with a single rinse.

Operating Conditions for Vivaflow[®] 50, 50R and Vivaflow[®] 200

Pump flow	200–400 ml/min
Maximum pressure	4 bar (60 psi)
Pressure drop across inlet outlet	0.5 bar (7 psi)
Maximum temperature	60°C

Diafiltration with Vivaflow® Devices

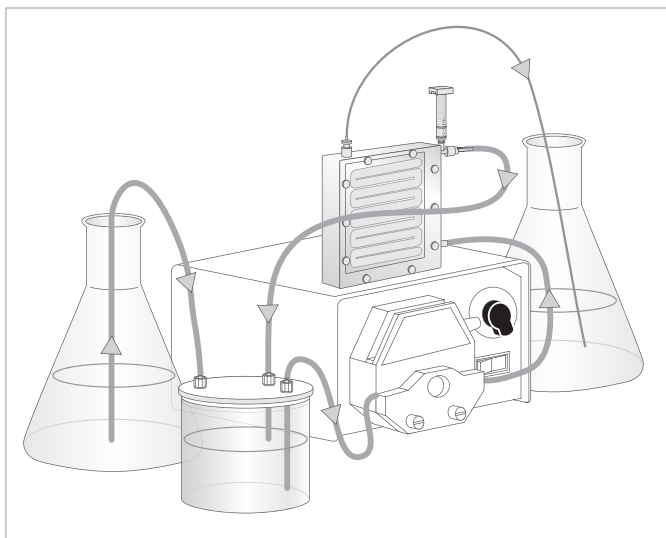


Diagram 2: Diafiltration with Vivaflow®

Convenient Diafiltration with Vivaflow®

Vivaflow® crossflow devices are ideal not only for sample concentration. They are just as easy to use for buffer exchange and | or diafiltration.

The diafiltration reservoir (order number VFA006) makes both the concentration step and the subsequent diafiltration step exceptionally convenient. The sample is concentrated using the diafiltration reservoir to hold a sample. When the requested concentration has been achieved, a tube leading into an additional buffer vessel will transfer new buffer into the system as the filtration run continues. The sample concentration and volume remain constant because buffer is gradually exchanged with the volume in the new vessel.

Technical Data

	Vivaflow® 50	Vivaflow® 50R	Vivaflow® 200
Materials of construction			
Main housing	Polycarbonate	Acrylic	Acrylic
Flow channel	TPX (PMP)	Acrylic	Acrylic
Membrane support	TPX (PMP)	Polypropylene	Polypropylene
Membrane seals and O rings	Silicone	Silicone	Silicone
Pressure indicator	Polypropylene, SS** spring	Polypropylene, SS** spring	Polypropylene, SS** spring
Flow restrictor	Polypropylene	Polypropylene	Polypropylene
Fittings	Nylon	Nylon	Nylon
Tubing	PVC (medical grade)	PVC (medical grade)	PVC (medical grade)
Dimensions			
Overall L H W	107 84 25 mm	100 100 24 mm	126 138 38 mm
Channel W H	15 mm 0.3 mm	7.5 0.4 mm	10 mm 0.4 mm
Active membrane area	50 cm ²	50 cm ²	200 cm ²
Unrecoverable concentrate	1.5 ml	1.7 ml	5.3 ml
Hold-up volume (module)			
Min. recirculation volume	< 10 ml	10 ml	< 20 ml
Non-recoverable hold-up	< 0.5 ml	< 0.5 ml	< 1 ml
Operating Conditions			
Pump flow rate	200–400 ml/min	200–400 ml/min	200–400 ml/min
Maximum pressure	3 bar (45 psi)	3 bar (45 psi)*	3 bar (45 psi)*
Maximum temperature	60°C	60°C	60°C
Non-recoverable hold-up	< 0.5 ml	< 0.5 ml	< 1 ml

* Pressure drop across inlet | outlet 0.5 bar (7 psi)

** SS= Stainless steel

Operating Several Vivaflow® Devices for Higher Concentration Speed and Throughput

Vivaflow® 50

Vivaflow® 50 cassettes are modular devices that can easily be scaled up to six devices in order to increase the maximum throughput within challenging timelines. Accelerated speed and throughput in all Vivaflow® devices completely depend on, and are proportional, to their membrane area, as demonstrated in Diagram 3.

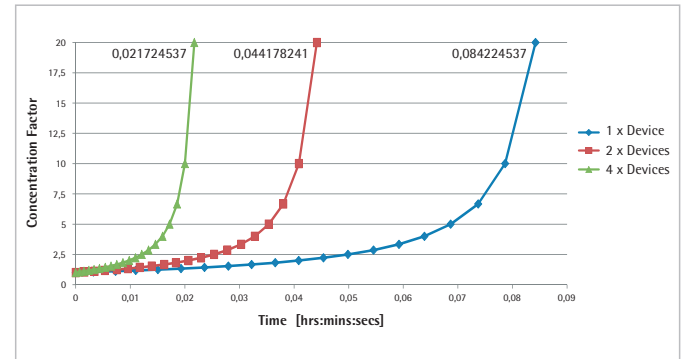


Diagram 3: Accurate scaleup of Vivaflow® 50, as shown here for one to four units

Setting Up Multiple Vivaflow® Cassettes

Vivaflow® 50

The membrane area is easy to expand by attaching several Vivaflow® 50 units featuring a unique interlocking mechanism. Up to three devices can be stacked, thus increasing the throughput in series. When more than three devices are connected, two separate stacks must be used. As a result, these devices operate both in parallel and in series.

However, this does not have any effect on the performance of the Vivaflow® 50 devices, as this configuration ensure that flow remains completely proportional to the membrane surface area. Diagram 4 and Table 2 provide an overview on how to scale up Vivaflow® 50 along with the accessories required.

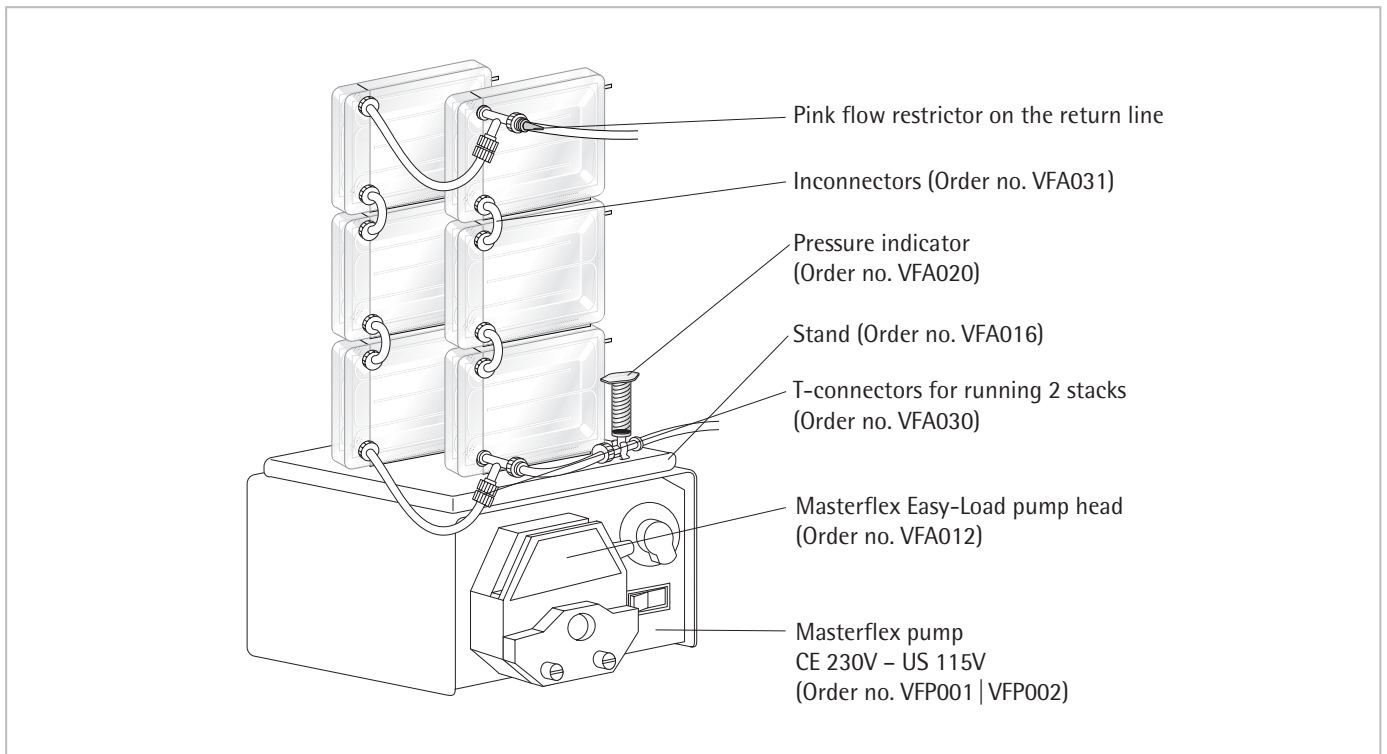


Diagram 4: System components for setting up multiple Vivaflow® 50 cassettes

Choosing the components for operating 1 to 6 Vivaflow® 50 units

	Order No.	1 VF 50	2 VF 50	3 VF50	4 VF50	5 VF50	6 VF50
Masterflex pump	FP001 VFP002	1	1	1	1	1	1
Masterflex Easy-Load pump head size 16	VFA012	1	1	1	1	1	1
Pressure indicator	VFA020	optional	1	1	1	1	1
Interconnectors	VFA031	–	(1)* Available in the package	(2)* Available in the package	(2)* Available in the package	(3)* Available in the package	4 (3) Available in the package – Additional VFA031 needed
T-connector	VFA030	–	–	–	1 pkg.**	1 pkg.**	1 pkg.**
Vivaflow® 50 stand	VFA016	optional	1	1	1	1	1
Diafiltration reservoir	VFA006	optional	optional	optional	optional	optional	optional
Operating mode		Single	Serial	Serial	Serial and parallel	Serial and parallel	Serial and parallel

* No additional purchase is necessary. One series interconnector is included in a package of two Vivaflow® 50 devices.

** One package of T-connectors contains two T-connectors.

Table 2: System components for setting up multiple Vivaflow® 50 cassettes

Choosing the components for operating 2 Vivaflow® 50R or 2 Vivaflow® 200 units

	Order No.	1 VF 50R	2 VF 50R	1 VF200	2 VF200
Masterflex pump	VFP001 VFP002	1	1	1	1
Masterflex Easy-Load pump head size 16	VFA012	1	1	1	–
Masterflex Easy-Load pump head size 15	VFA013	–	–	–	1
Pressure indicator	VFA020	Available in package	Available in package	Available in package	Available in package
Y-connector	VFA005	–	–	–	1
T-connector	VFA030	–	1	–	–
Diafiltration reservoir	VFA006	optional	optional	optional	–
Operation mode		Single	Series	Series	Series

Table 3: System components for setting up 2 Vivaflow® 50R and 2 Vivaflow® 200 cassettes

Vivaflow® 50R and Vivaflow® 200

The throughput for Vivaflow® 50R and Vivaflow® 200 can be increased and the filtration time reduced by adding another unit to the setup. Table 3 shows the additional components required for scaling up either system.

Diagram 5 and diagram 6 sketch the setting of two Vivaflow® 50R and two Vivaflow® 200, showing all necessary accessories and connectors.

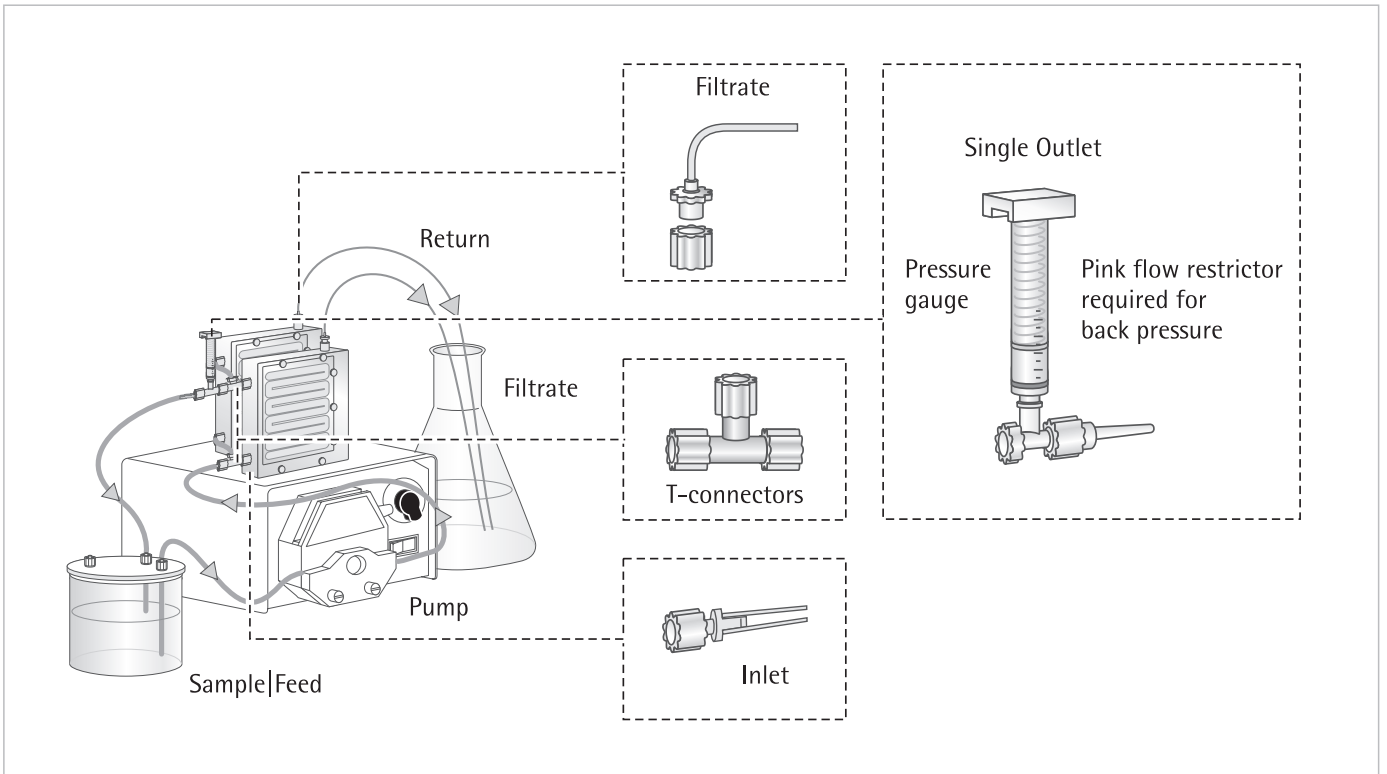


Diagram 5: Setting up two Vivaflow[®] 50R devices

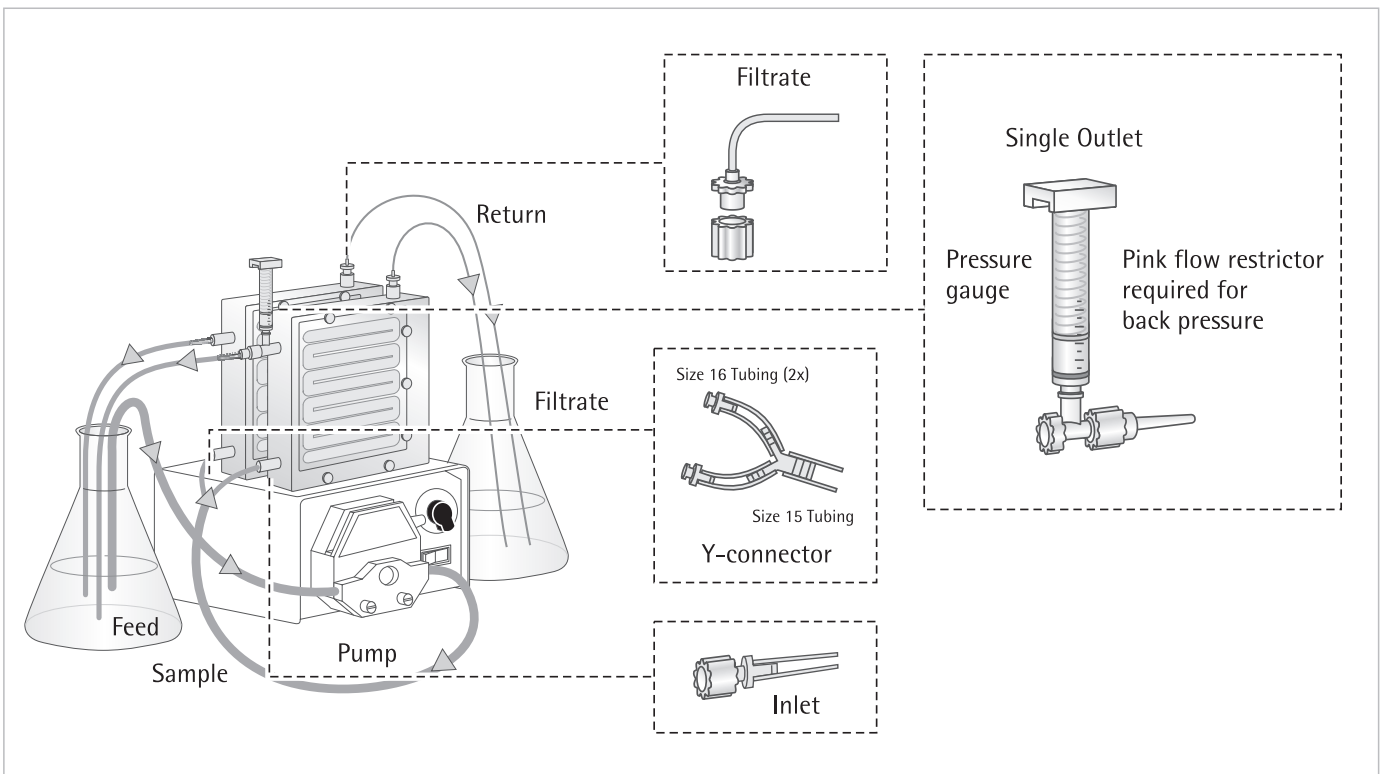


Diagram 6: Setting up two Vivaflow[®] 200 devices

Performance Characteristics for Vivaflow® 50

	Time needed to achieve a 20-fold concentration (in minutes) at 3 bar (45 psi) inlet pressure, 20°C			
	Single Device	Three Devices	Solute Recovery in %	
	250 ml Initial Vol. in Min.	1 l Initial Vol. in Min.	Direct	10 ml Rinse
BSA 1.0 mg/ml (66,000 MW)				
5,000 MWCO PES	34	49	96%	> 99%
10,000 MWCO PES	22	32	94%	> 99%
30,000 MWCO PES	22	32	92%	99%
50,000 MWCO PES	20	29	92%	98%
γ Globulins 1.0 mg/ml				
100,000 MWCO PES	43	62	92%	98%
100,000 MWCO RC	40	58	92%	98%
Yeast, 1.0 mg/ml (<i>S. cerevisiae</i>)				
0.2 μm PES	33	47	92%	98%

Performance Characteristics for Vivaflow® 50R

	Time to concentrate up to 20x (min) at 3.0 bar inlet 2.5 bar outlet pressure, 20°C			
	Initial Volume	Average Flux	Recovery in %	
	250 ml	ml/min	Direct	25 ml Rinse
Lysozyme, 0.25 mg/ml (14,000 MW)				
5,000 MWCO Hydrosart®	70	3.4	96%	98%
10,000 MWCO Hydrosart®	23	10.3	94%	96%
BSA 1.0 mg/ml (66,000 MW)				
10,000 MWCO Hydrosart®	24	9.9	98%	> 99%
30,000 MWCO Hydrosart®	15	15.8	97%	> 99%
γ Globulins 1.0 mg/ml (150,000 MW)				
100,000 MWCO Hydrosart®	46	5.2	97%	> 99%
Initial volume 1 liter (one Vivaflow® 50R at 3 bar) 10,000 MWCO Hydrosart®				
BSA 1.0 mg/ml	95	10.0	98%	> 99%
Initial volume 1 liter (two Vivaflow® 50R in parallel at 3 bar) 10,000 MWCO Hydrosart®				
BSA 1.0 mg/ml	48	19.8	98%	> 99%

Performance Characteristics for Vivaflow® 200

Time to achieve a 20-fold concentration (in minutes) at 3 bar (45 psi) inlet pressure, 20°C

	Initial Volume	Average Flux	Recovery in %	
	1 liter	ml/min	Direct	25 ml Rinse
Lysozyme, 0.25 mg/ml (14,000 MW)				
2,000 MWCO Hydrosart®	160	6	97%	> 99%
3,000 MWCO PES	180	5	97%	> 99%
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 Hydrosart®	35	27	98%	> 99%
30,000 MWCO PES	25	38	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 Hydrosart®	45	21	96%	99%
Yeast, 1.0 mg/ml (<i>S. cerevisiae</i>)				
0.2 μm PES	11	86	92%	98%
Dilute solute concentration, initial volume 1 liter 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 Vivaflow® 200 in parallel at 3 bar) 10,000 MWCO PES				
BSA 1.0 mg/ml (66,000 MW)	67	70	97%	> 99%

Ordering Information

	Quantity	Order No.
Vivaflow® 50 include filtrate tube, size 16 peristaltic tubing, flow restrictor and fittings and 1 × series interconnector		
3,000 MWCO (PES)	2	VF05P9
5,000 MWCO (PES)	2	VF05P1
10,000 MWCO (PES)	2	VF05P0
30,000 MWCO (PES)	2	VF05P2
50,000 MWCO (PES)	2	VF05P3
100,000 MWCO (PES)	2	VF05P4
0.2 µm (PES)	2	VF05P7
100,000 MWCO (RC)	2	VF05C4
Vivaflow® 50 complete system comprises		
Pump (240 V), Easy-Load pump head (size 16), tubing, 500 ml sample diafiltration reservoir, module stand, pressure indicator, T connectors, series interconnectors	1	VFS502
Pump (115 V), Easy-Load pump head (size 16), tubing, 500 ml sample diafiltration reservoir, module stand, pressure indicator, T-connectors, series interconnectors	1	VFS504
Vivaflow® 50R modules include pressure indicator, flow restrictor and size 16 PVC peristaltic tubing and fittings		
5,000 MWCO Hydrosart®	1	VF05H1
10,000 MWCO Hydrosart®	1	VF05H0
30,000 MWCO Hydrosart®	1	VF05H2
100,000 MWCO Hydrosart®	1	VF05H4
Vivaflow® 200 modules include pressure indicator, flow restrictor and size 16 PVC peristaltic tubing and fittings		
3,000 MWCO PES	1	VF20P9
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
2,000 MWCO Hydrosart®	1	VF20H9
5,000 MWCO Hydrosart®	1	VF20H1
10,000 MWCO Hydrosart®	1	VF20H0
30,000 MWCO Hydrosart®	1	VF20H2
100,000 MWCO Hydrosart®	1	VF20C4

	Quantity	Order No.
Vivaflow® 50R 200 complete system comprises		
Pump (240 V), Easy-Load pump head (size 16), tubing, 500 ml sample diafiltration reservoir	1	VFS202
Pump (115 V), Easy-Load pump head (size 16), tubing, 500 ml sample diafiltration reservoir	1	VFS204
Vivaflow® accessories		
Masterflex Economy Drive variable speed peristaltic pump (230 V)		VFP001
Masterflex Economy Drive variable speed peristaltic pump (115 V)		VFP002
500 ml sample and or diafiltration reservoir		VFA006
Masterflex Easy-Load pump head – size 15		VFA013
Masterflex Easy-Load pump head – size 16		VFA012
Vivaflow® 50 stand		VFA016
Pressure indicator (1 – 3 bar)		VFA020
Vivaflow® 50 accessories for operating > 2 devices		
T-connectors for running 2 stacks	2	VFA030
Series interconnectors	6	VFA031
Pressure indicator (1 – 3 bar)	1	VFA020
Vivaflow® 50R accessories for operation of two modules		
T-connector	2	VFA030
Vivaflow® 200 accessories for operating two modules		
Y-connector (size 15 to 2 × size 16, Luer fittings)	1	VFA005
Masterflex Easy-Load pump head – size 15	1	VFA013

For a complete set of accessories, please see our website or our Lab Filtration catalogue.

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