

User Guide

Viresolve® Barrier Filter

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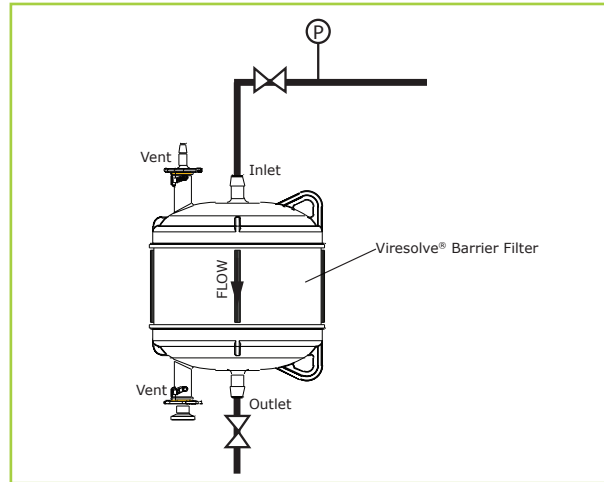
Introduction

Viresolve® Barrier Filters are designed for processing chemically defined cell culture media and other bioreactor feeds and additives. This guide applies to the following products:

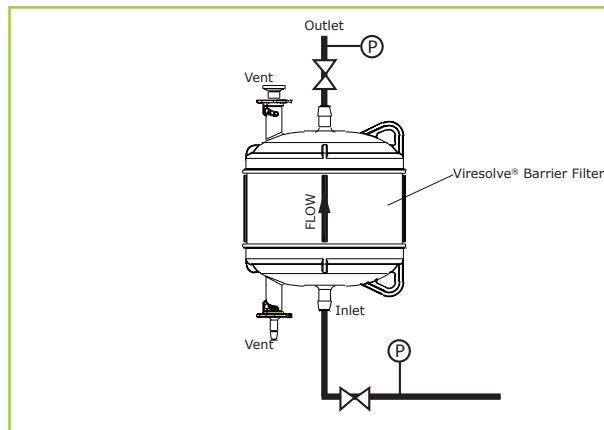
Catalog Number	Gamma Compatible Viresolve® Barrier Capsule Filter	
	Filtration Area (m ²)	Inlet/Outlet Connections
VBKG005HB1	0.05	HB/HB
VBKG005TC1	0.05	TC/TC
VBKG015HB1	0.15	HB/HB
VBKG015TC1	0.15	TC/TC
VBKG050HB1	0.5	HB/HB
VBKG050TC1	0.5	TC/TC
VBKG100HB1	1.0	HB/HB
VBKG100TC1	1.0	TC/TC

Installing the Filter

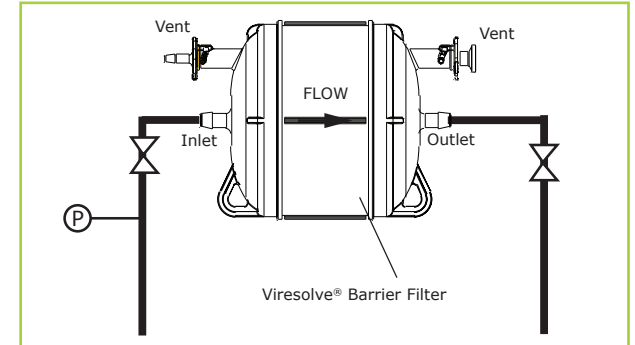
The filter may be installed vertically with the inlet on the top or bottom, or horizontally.



Viresolve® Barrier Filter Vertical Installation, Inlet on Top



Viresolve® Barrier Filter Vertical Installation, Inlet on Bottom



Viresolve® Barrier Filter Horizontal Installation

1. Orient the capsule in the process so that fluid flow follows the flow indicator arrow on the capsule label.
2. Attach a pressure gauge to the inlet port of the filter. Attach isolation valves to the inlet and outlet ports of the capsule to allow flushing, venting and draining operations.
3. Attach the inlet port and outlet port of the filter to the process lines. Attach tubing to the highest vent port and direct tubing to drain or waste vessel.

Flushing and Wetting

Flushing is beneficial to filtrate quality and will eliminate most extractable substances.

1. Connect flushing or wetting fluid (water for injection (WFI) or equivalent, or cell culture media) source to filter inlet. If using cell culture media, studies must be performed to demonstrate adequate wetting performance.
2. Close the isolation valve on the outlet side of the capsule. Open vent port located at the highest point of the filter.
3. Gradually open the inlet isolation valve and slowly flow liquid into the filter until 0.35 bar(d) (5 psid) is reached and a continuous flow of liquid, free of air, is observed exiting the vent port.
4. Close the inlet isolation valve and then the highest vent port. Visually verify that no air bubbles are present inside the capsule. If large air bubbles are present, repeat steps 1 through 3.
5. Open the inlet and outlet isolation valves, and adjust the operating conditions to achieve a minimum of 1.4 bar(d) (20 psid) across the filter.
6. Flush/wet the filter with at least 40 L/m² of liquid.
7. Once wetting/flushing is achieved, transition to a product stream without introducing air into the system as this could cause air locking which will reduce the functional filtration area.

Flow Rate Verification

An indication that the filter is properly wet is that the water flow rate is within the acceptable ranges listed in the table below. To verify that the filter is properly wet, use the following method to determine the temperature corrected water flow rate.

Flow Rate Ranges at 25 °C and 2.1 bar(d) (30 psid)

Filter Area (m ²)	Flow Rate Range at 2.1 bar (30 psid) in LPM
0.05	0.47 to 0.87
0.15	1.41 to 2.61
0.5	4.70 to 8.70
1.0	9.40 to 17.40

To verify that the filter is properly wet, use the method below to determine if the water flow rate is within the acceptable range.

1. Measure the flow rate through the filter using a flow meter, graduated cylinder and stop watch, or by placing the outlet tubing into a collection vessel on a balance.
2. Record the flow rate until a stable flow rate is observed for three consecutive minutes. Record water temperature.
3. If the flow is pressure driven, slowly depressurize the system and empty the feed vessel. If the flow is pump driven, turn off the feed pump and close the inlet valve.
4. Calculate the temperature-corrected flow rate ($Q_{25^{\circ}C}$) using this equation: $Q_{25^{\circ}C} = Q_p * F$

Where:

Q_p is the filtrate flow rate in mL/min (assume a density of 1 g/mL for water to convert weight to volume)

F is the Temperature Correction Factor from the following table.

Temperature Correction Factor (F)*

T (°F)	T (°C)	F	T (°F)	T (°C)	F
104.0	40	0.734	71.6	22	1.072
102.2	39	0.748	69.8	21	1.098
100.4	38	0.762	68.0	20	1.125
98.6	37	0.777	66.2	19	1.152
96.8	36	0.793	64.4	18	1.181
95.0	35	0.808	62.6	17	1.212
93.2	34	0.825	60.8	16	1.243
91.4	33	0.842	59.0	15	1.276
89.6	32	0.859	57.2	14	1.310
87.8	31	0.877	55.4	13	1.346
86.0	30	0.896	53.6	12	1.383
84.2	29	0.915	51.8	11	1.422
82.4	28	0.935	50.0	10	1.463
80.6	27	0.956	48.2	9	1.506
78.8	26	0.978	46.4	8	1.551
77.0	25	1.000	44.6	7	1.598
75.2	24	1.023	42.8	6	1.648
73.4	23	1.047	41.0	5	1.699

*Based on water fluidity relative to 25°C (77°F)
 Fluidity Value $F = (\mu_{T\text{ }^\circ\text{C}}/\mu_{25^\circ\text{C}})$ or $(\mu_{T\text{ }^\circ\text{F}}/\mu_{77^\circ\text{F}})$

If the filter does not meet the specification, check the water temperature and pressure and repeat the $Q_{25^\circ\text{C}}$ measurement. If the value falls outside the recommended range, contact Technical Service.

NOTE If flow is pump-driven, use the temperature-corrected flow rate and observed pressure to calculate water permeability. Devices of all sizes should exhibit water permeability 273-505 LMH/bar (18.8-34.8 LMH/psi).

Integrity Testing

NOTE Viresolve® Barrier Filters **MUST** be wetted prior to use and integrity testing.

Test the integrity of the filter by measuring the diffusional flow rate of air through the wetted membrane. Refer to the table below for the diffusion flow rate specification. For multi-unit installations, test each capsule individually.

Filter Area (m ²)	Filter Catalog Number	Air/Water Diffusion Flow Rate at 3.4 bar(d) (50 psid) in water at 25 °C (cc/min)
0.05	VBKG005HB1, VBKG005TC1	≤ 2.2
0.15	VBKG015HB1, VBKG015TC1	≤ 6.6
0.5	VBKG050HB1, VBKG050TC1	≤ 22
1.0	VBKG100HB1, VBKG100TC1	≤ 44

The integrity test may be performed using an automated integrity tester or a manual integrity test set-up.

Automated Integrity Testing

The Integritest® Automated Integrity Test Instruments are recommended. Refer to the instrument user guide for instructions.

For other automated integrity testers, the auto or default stabilization time setting can stop the test prematurely, and the resulting equilibration time may not be sufficient to achieve an accurate air diffusion measurement. Contact Technical Service for guidance with other integrity testers.

1. For post-use testing, after filtration, flush WFI or Milli-Q®

water through the Viresolve® Barrier filter installation at a minimum of 1.4 bar(d) (20 psid) across the filter until a stable flow rate is observed for three consecutive minutes.

2. Open the valve connected to the outlet to drain the filter.
3. Integrity test the filter at 3.4 bar(d) (50 psid).
4. If the installation fails the integrity test, rewet the filter at a minimum of 1.4 bar(d) (20 psid) across the filter, ensuring proper venting, and check the integrity test protocols used.

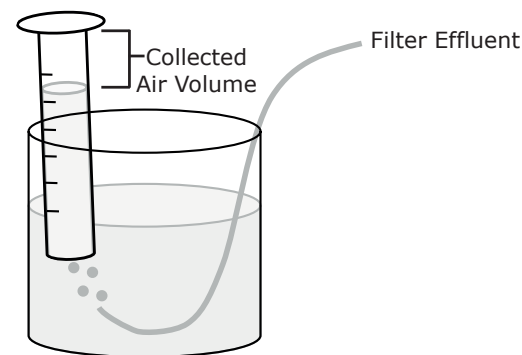
NOTE Integrity testing introduces air into the filter. If integrity testing prior to use, ensure the filter is fully wetted after the integrity test by re-venting and re-wetting with a minimum of 40 L/m² of wetting fluid at a minimum of 1.4 bar(d) (20 psid) across the filter.

Manual Integrity Testing

The integrity test may be performed manually using a graduated cylinder inverted in a vessel of water, or using a downstream mass flowmeter.

1. For post-use testing, after filtration, flush WFI or Milli-Q® water through the filter installation at a minimum of 1.4 bar(d) (20 psid) across the filter until a stable flow rate is observed for three consecutive minutes.
2. Connect process air line to inlet on the filter.
3. Open the outlet valve.
4. Slowly increase air pressure to 3.4 bar(d) (50 psid) across the filter.
5. Drain water through the outlet line. After the filtrate flow is reduced to slow dripping allow the system to stabilize for one to five minutes.

6. Measure the diffusion flow rate for 90 seconds using a downstream mass flow meter or an inverted cylinder. To use a graduated cylinder, fully submerge a graduated cylinder in water, removing all the air. Invert the cylinder with the top approximately 5 cm (2 in.) below the surface of the water. Submerge the filter effluent line into the water, directly beneath the opening of the graduated cylinder and record the volume of air collected.



Manual integrity test setup using inverted cylinder.

7. Calculate the volume of air collected per minute.
8. Compare the test results to the specifications.
9. Release the pressure in the feed vessel. Disconnect the filter.
10. If the installation fails the integrity test, rewet at a minimum of 1.4 bar(d) (20 psid) across the filter, ensure proper venting and check the integrity test protocols used.

NOTE Integrity testing introduces air into the filter. If integrity testing prior to use, ensure the filter is fully wetted after the integrity test by re-venting and re-wetting with a minimum of 40 L/m² of wetting fluid at a minimum of 1.4 bar(d) (20 psid) across the filter.

Filtering Cell Culture Media

1. Add the desired volume of media to the feed vessel. Record the media temperature.
2. Attach the air supply and pressurize the feed vessel to the selected operating pressure or set the pumping system to the desired flow rate. If a pumping system is used, do not exceed the maximum pressure rating for the pump tubing.
NOTE Ensure no mixing occurs in the media vessel, as this will introduce air into the media stream and hinder the Viresolve® Barrier filter performance.
3. Connect the media source to the inlet of the filter. Attach a collection vessel to the filter outlet.
4. Vent the filter before starting media filtration by opening the highest vent valve and then flowing fluid using the selected operating pressure or desired flow rate. Close the vent after a continuous stream of liquid is observed exiting from the vent.
5. Perform media filtration using the selected pressure or desired flow rate determined during process development. Inlet pressure must not exceed 4.1 bar (60 psi).
6. When the filtration endpoint is reached, stop the process, by either stopping the feed pump or by slowly depressurizing the feed vessel and removing the air supply.

Standard Warranty

The applicable warranty for the products listed in this publication may be found at www.millipore.com/terms (within the “Terms and Conditions of Sale” applicable to your purchase transaction).

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