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Standard Warranty



Viresolve® Pro Micro Device User Guide



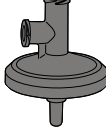
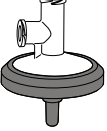
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Introduction

Viresolve Pro Micro Devices are typically used for process optimization, viral clearance validation and filtration of small batch volumes of proteins.

This manual applies to the following devices:

	Process Development Kit	Validation Kit
Catalogue No.	VPMCPDKNB9	VPMCVALNB9
Color	Solid Teal 	Teal and White 
Integrity Testing	Not Binary Gas Tested	Binary Gas Tested
Primary Intended Use	Process Development Optimization, scale-up, etc.	Virus Validation

Installing the Device

Testing should be conducted with a user supplied pump at a constant flow rate or a constant pressure. A low volume constant pressure holder (Millipore Catalog number VIRUSVMAX or equivalent) is recommended for constant pressure testing of Viresolve Pro devices. This user guide provides instructions for conducting testing at a constant pressure. Contact Millipore for instructions on testing at a constant flow rate.

1. Remove caps from all devices. Attach a two-way luer valve to both the feed port (V1) and vent port (V2) of the device. Connect the feed vessel to the luer valve on the feed port. Close both luer valves.
2. Position a filtrate collection vessel and a weighing balance (to record filtrate mass) beneath the device. Fill the feed vessel with at least 125 mL of Milli-Q® water, water for injection (WFI) or equivalent.
3. Record the temperature of the fluid.
4. Purge the system by following the device purging sequence.

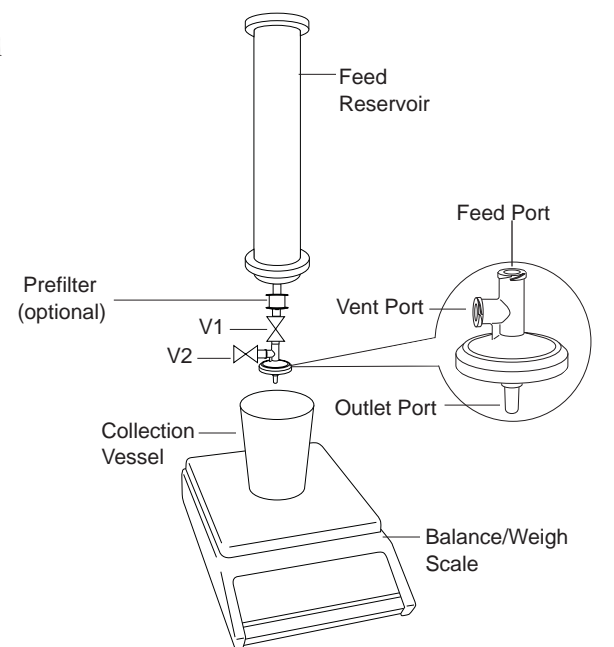


Figure 1. Typical setup

Purging the Device

Purging is recommended to remove air from the device before use.

1. Open V2. Open V1 until fluid begins to drain from V2 (approximately five seconds).
2. Close V2. Close V1.

Flushing and Wetting

Milli-Q water, WFI or equivalent is required to wet and flush the filters.

1. After purging the device, attach an air supply to the feed reservoir.
2. Pressurize the system to 2.07 bar (30 psi).
3. Tare the weigh scale.
4. Open V1 and start recording the elapsed time and the weight of the filtrate collected. Record the weight every minute, for at least ten minutes, until a stable flow rate is observed for three consecutive minutes. Close V1 to stop the flow. Record fluid temperature. Calculate the temperature corrected flow rate ($Q_{25^{\circ}C}$) for water (see **Flow Rate Calculation**).
5. Depressurize the system and remove the air supply. Empty the feed vessel. Open V1 to ensure all liquid is drained from the device. Close V1.

Measuring Buffer Flux

1. Fill the feed vessel with buffer. Record the temperature of the buffer. Purge the device (see **Purging the Device**). Attach the air supply and pressurize the feed reservoir to 2.07 bar (30 psi).
2. Place a clean, empty collection vessel beneath the device outlet port on the weigh scale. Tare the scale.
3. Open V1 and start recording elapsed time and the mass of the filtrate collected. Record the mass every minute for at least ten minutes. Close V1 to stop flow. Record the fluid temperature. Depressurize the feed reservoir.
4. Calculate the $Q_{25^{\circ}C}$ for the buffer (see **Flow Rate Calculation**).
5. Empty the remaining buffer from the feed reservoir.

Flow Rate Calculation

Flow Rate at 25 °C and 2.07 bar (30 psi): 1.1 to 3.9 mL/min.

Calculate the temperature-corrected flow rate ($Q_{25^{\circ}C}$) using the following equation:

$$Q_{25^{\circ}C} = Q_p * F$$

Where:

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

F is the Temperature Correction Factor from Table 1.

Table 1. Temperature Correction Factor (F)*

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

*Based on Water Fluidity Relative to 25 °C (77 °F)

$$\text{Fluidity Value } F = (\mu_{T^{\circ}C} / \mu_{25^{\circ}C}) \text{ or } (\mu_{T^{\circ}F} / \mu_{77^{\circ}F})$$

If the device does not meet the specification listed above, check the water temperature and pressure and repeat the $Q_{25^{\circ}C}$ measurement. If the value falls outside the recommended range stated above, replace the device and start over.

Note If the device does not meet specification, store in a beaker of 2 to 8 °C water and notify your Millipore representative.

Filtering Product

1. Add the desired volume of protein to the feed vessel. Record the protein temperature. Follow the purge procedure. Attach the air supply and pressurize the feed vessel to 2.07 bar (30 psi).
2. Place a clean, empty collection vessel beneath the device outlet port on the weigh scale. Tare the scale.
3. Open V1 and start recording the mass of the filtrate collected at desired time intervals. Stop the process (close V1) when the target conditions (e.g. volume, flux) have been reached.
4. Depressurize the feed vessel and remove the air supply.

Post-Use Buffer Flush (Optional for Product Recovery)

1. Empty the protein from the feed vessel and replace it with approximately 10 mL of buffer. Attach the air supply and pressurize to 2.07 bar (30 psi). Place a clean, empty collection vessel beneath the device outlet port on the weigh scale. Tare the scale.
2. Open V1 and monitor the mass of filtrate collected. Stop the process (close V1) when 3 mL of buffer is collected.
3. Depressurize the feed reservoir and remove from the air supply. Empty the feed reservoir and the collection vessel. Purge the device (see **Purging the Device**) and perform an integrity test.

Integrity Testing (Optional)

Note The device must be fully wetted with water or buffer before performing this test.

The device filtration area is approximately 3.1 cm². The diffusional flow rate is too low to measure accurately, therefore a gross pass/fail integrity test is recommended.

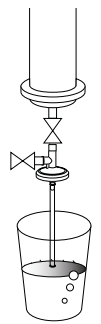


Figure 2. Integrity Test

1. Place a beaker of water beneath the outlet port of the device. Attach one end of the filtrate tubing to the outlet port and immerse the other end in the beaker of water.
2. Attach the air supply to the feed vessel. Open the inlet air valve and pressurize the system to 0.3 bar (5 psi). Open V1 and V2 to drain any liquid. Close V2. Increase pressure to 3.5 bar (50 psi).
3. After five minutes have elapsed, watch for bubbles exiting the immersed filtrate tubing. After observing for one minute, no bubbles should be visible exiting an integral device.
4. Slowly release the pressure in the feed vessel and close V1.

Note Rapid depressurization after integrity testing may damage the device.

5. Disconnect the device. If the device is integral, discard it. If the device is not integral, store it in a beaker of 2 to 8 °C water and notify your Millipore representative.