cytiva

Sterile **ReadyToProcess** Hollow Fiber Cartridges

Instructions for Use



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1 Introduction

Cytiva sterile ReadyToProcess™ hollow fiber cartridges are prewetted to minimize setup time, validated to be sterile, and disposable to reduce operating costs. Read these instructions and the safety precautions before using your new hollow fiber cartridge.

2 Inspect the Cartridge

Open the cartridge box and check the cartridge for damage, ensuring the outer and inner bags are intact. A Cytiva Certificate of Quality is available online at *cytiva.com/certificates*.

The Certificate of Quality documents manufacturing information, product release criteria, and regulatory conformance. Check the cartridge's expiration date and make sure the gamma radiation label is red, indicating the cartridge was radiated.

3 General Description

The ReadyToProcess hollow fiber cartridge includes a feed port, retentate port, and two permeate ports (see Figure below). The cartridge is shipped sterilized and uses disposable aseptic connectors that maintain sterility when you connect the cartridge to your filtration system.

Squeezing or releasing the flow control clamps enables you to throttle the flow of fluid through the flexible tubing.

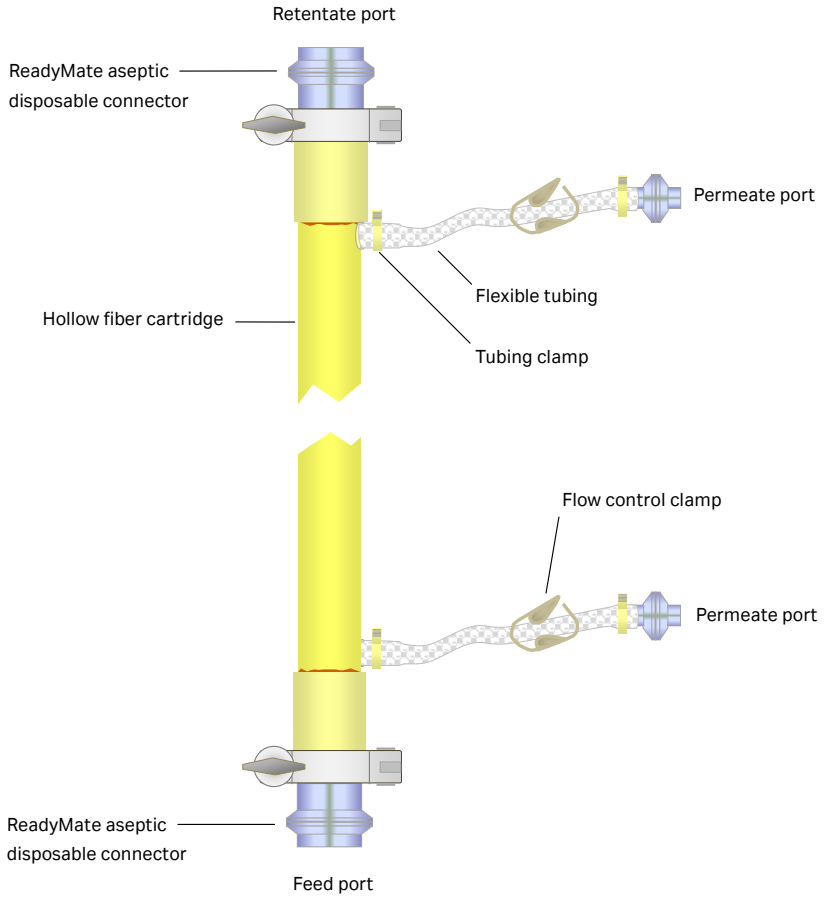


Figure 3.1: One of several configurations of a sterile, ReadyToProcess hollow fiber cartridge as delivered

4 Learn the Operating Limits

Pressures—UF CFF Filters

Maximum pressure from the pump discharge—60 psig @ 20°C

Maximum permeate pressure—1 barg (15 psig) @ 20°C

Pressures—MF CFF Filters

Maximum pressure from the pump discharge @ 20°C:

30 psig for 0.1 µm pore size

25 psig for 0.2 µm pore size

15 psig for 0.45 and 0.65 µm pore size

Maximum permeate pressure = 1 barg (15 psig) @ 20°C

5 Install the Cartridge

Before opening the outer bag, reference the cartridge's catalog number and check it's performance specifications to make sure the cartridge meets your application requirements. Record the cartridge's batch number and serial number.

Remove the Cartridge from its Packaging

Inner and outer plastic bags protect each ReadyToProcess hollow fiber cartridge from contamination and damage. To open the outer bag, grip each side of the bag just below the seal and snap the seal apart. Other opening techniques will cause the protective bag to stretch rather than open. Repeat this procedure to open the inner protective bag.

Connect the Cartridge to the ReadyCircuit System

Connect the cartridge's feed, retentate, and permeate ports to your ReadyCircuit system using the ReadyMate™ disposable aseptic connectors (*Fig. 5.1, on page 8*). To learn more about ReadyMate disposable aseptic connectors, consult the *ReadyMate Disposable Aseptic Connectors Instructions (28938570)* or see *Chapter 6 Using ReadyMate Disposable Aseptic Connectors (DAC), on page 9*.

Tighten Bio-Clamp (size 5 and above)

The Bio-Clamp screw may loosen slightly during the gamma irradiation process and subsequent shipping. To make sure that the clamp is secure and will not leak under pressure, hand tighten the screw clockwise prior to use.

Position the CFF Bag Assembly for Proper Mixing

A cross flow filtration bag can be positioned vertically or horizonatally. If mixing in a Cytiva ReadyCircuit horizontal tray, set the tray pitch to maximum using the pitch adjustment leg on the tray. Place the top of the bag at the top of the pitch.

The recommended turnover time for the operating volume is less than 8 minutes. Direct the return flow to the top port on the bag to achieve better mixing as compared to using a lower return port on the bag.

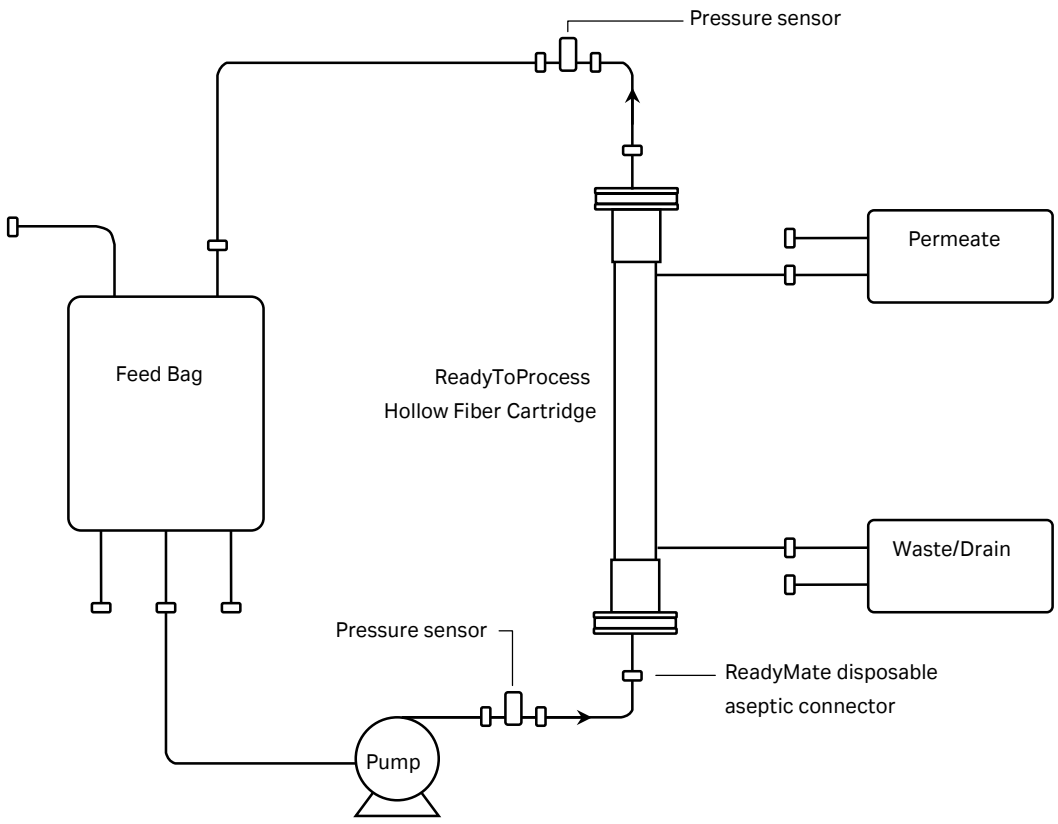


Figure 5.1: Typical flow path for hollow fiber cartridge applications

Install Pressure Sensors

It is important to a install pressure sensor inline between the pump outlet and filter inlet to monitor filter inlet pressure. It is also important to install a pressure sensor inline between the filter retentate port and the feed bag inlet port to monitor pressure and enable the measurement and calculation of the transmembrane pressure. The pump and pressure sensors must be sized properly to the tubing in the system.

Before starting the process, make sure the system tubing is not kinked or pitched, and note the tubing life expectancy in hours.

6 Using ReadyMate Disposable Aseptic Connectors (DAC)

Connecting Disposable Aseptic Connectors

When you are ready to connect your ReadyToProcess processing system components, follow the steps below. If you would like to stage your processing system components (holding the disposable aseptic connectors together without breaking the aseptic seals until you are sure the components are setup correctly), see *Using ReadyMate Mates to Preconfigure Your System, on page 10*.

Step	Action
1	Remove the protection cap and release paper from the face of each DAC.
2	Tilt the DACs to engage the hook of one connector with the slot of the other (see illustration below). Bring the connectors together and press together until you hear an audible click.

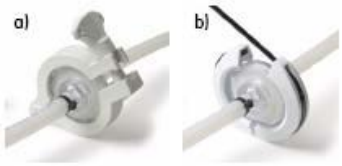
Connectors shown with no tubing connected.



3	Bring the tabs together (a) and pull both tabs out from the connectors (b) until the protective film is completely removed (c).



Step	Action
4	Apply a standard BioClamp™ (a), a disposable ReadyClamp (b), or a stainless steel sanitary clamp to the connector assembly to lock it closed.

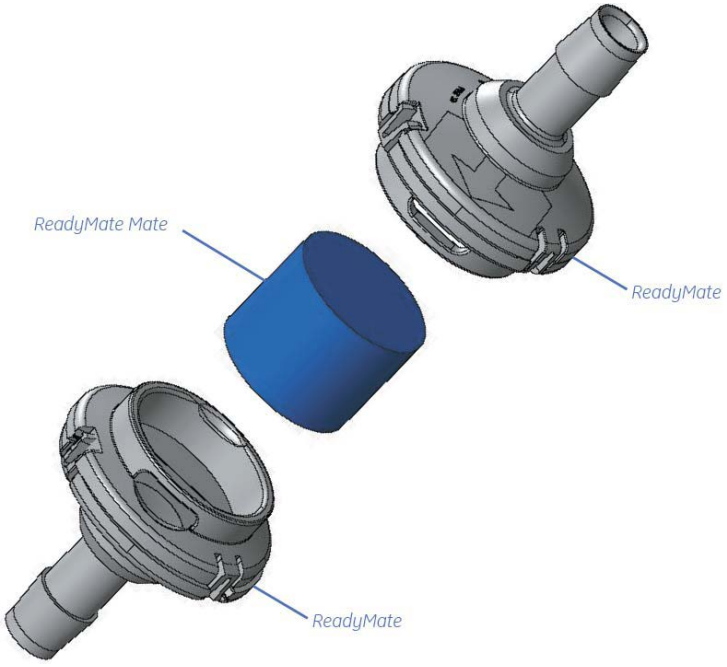


Using ReadyMate Mates to Preconfigure Your System

ReadyMate Mates enable you to hold disposable aseptic connectors (DAC) together without breaking the aseptic seals on the connectors. This enables you to preconfigure your system to make sure you have the necessary components and to optimize supports and tubing runs.

The ReadyMate Mate is a close cell foam disk that fits inside the protective covers of the aseptic connectors. The friction fit holds the mated parts together until you are ready to make the aseptic connection. Follow these steps to use a ReadyMate Mate:

Step	Action
1	Insert a ReadyMate Mate into the ReadyMate DAC protective cover.



2	Align a second ReadyMate and repeat step 1.

Step	Action
3	After preconfiguring your system, remove the ReadyMate Mates and make the aseptic connections following the instructions in the section entitled, Using *Chapter 6 Using ReadyMate Disposable Aseptic Connectors (DAC), on page 9*

7 Flush the Cartridge

Your new ReadyToProcess, hollow fiber cartridge is prewetted and meets the following specification:

- Total organic carbon = < 500 ppb
- Conductivity = < 1.3 µS/cm)

You can lower the total organic carbon (TOC) and conductivity by flushing the cartridge. If your process requires specific limits of TOC and conductivity, you should verify or validate the flushing process. If required, flush your cartridge following these steps:

Step	Action
1	Connect one permeate line to a waste container.
2	Fill the filtration system's feed bag with a volume of clean water (WFI) that will enable you to meet your TOC and conductivity objectives (Figure 7.1).
3	Make sure the permeate waste tubing valve is open. Close the other permeate tubing valve.

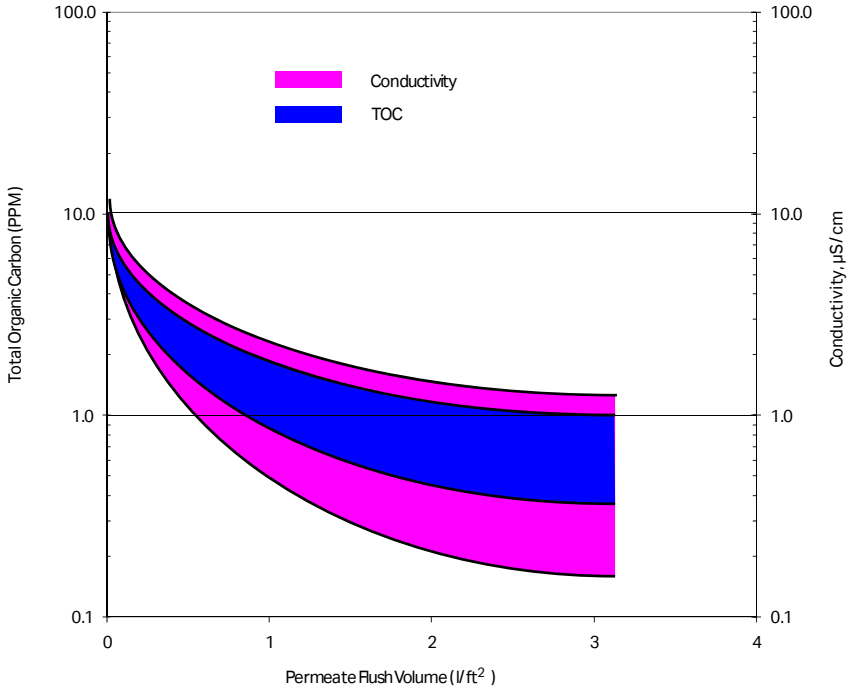


Figure 7.1: The influence of water flushing on total organic carbon and conductivity in cartridges

Step	Action
4	Start the pump on slow and adjust the feed pressure to: a. 0.8 barg (12 psig) for 10,000 NMWC through 50,000 NMWC pore sizes b. 0.5 barg (7 psig) for larger ultrafiltration pore sizes c. 0.1 barg (1.5 psig) for microfiltration
5	Adjust the pump speed and retentate back pressure such that the retentate flow rate is approximately 1/10th of the permeate flow while maintaining the transmembrane pressure.
6	Continue to rinse the cartridge until the feed bag is empty.

8 Condition the Cartridge with Buffer

For best results, you should condition the filtration system and filter with a buffer solution similar in pH, ionic strength, and temperature to your product solution using these steps:

Step	Action
1	Prepare the buffer solution. The recommended volume of buffer solution is 5 to 10 L/m^2 (0.5 to 1.0 L/ft^2) of filter surface area.
2	Bring the buffer to the proper temperature (if conditioning for temperature control) and add it to the feed bag.
3	Open the retentate and permeate waste tubing valves. Close the other permeate tubing valve. Start the feed pump on slow and increase the pump speed until solution flows from the retentate and permeate waste lines.
4	Adjust transmembrane pressure to: a. 0.7 barg (10 psig) for 10,000 NMWC through 50,000 NMWC pore sizes b. 0.3 barg (5 psig) for larger ultrafiltration pore sizes and microfiltration membranes
5	Close the permeate waste tubing valve. Increase the retentate flow rate to the recommended operating cross flow rate for the cartridge and run until no bubbles appear in the retentate stream.
6	Open the permeate waste tubing valve and, if necessary, adjust the retentate tubing valve to maintain the transmembrane pressures noted in step 4 above.
7	Recirculate the buffer solution for 30 minutes to condition for pH and ionic stability. If conditioning for temperature control, continue recirculating until the temperature of the system stabilizes. Note that it may be necessary to add additional buffer to the feed bag.
8	Drain the buffer from the feed bag, leaving a small amount in the bottom of the bag so that no air can be introduced into the circuit during the addition of sample or process fluids. Buffer may also be kept in the other parts of the circuit to prevent air entrainment.

9 Start Your Filtration Process

Go to the either the Ultrafiltration or Microfiltration sections below to learn how to start your filtrations process.

Ultrafiltration

Start filtering with ultrafiltration cartridges by closing the permeate tubing valves and fully opening the retentate tubing valve. This configuration enables you to establish the cross flow velocity prior to permeate withdrawal. Start the pump on slow speed. Slowly increase the speed while slowly closing the retentate tubing valve to establish the preferred feed flow rate and pressure. Then slowly open the permeate tubing valve.

In general, the pressure differential between the feed inlet and retentate outlet is a function of the following variables: cartridge length, recirculation rate, fiber diameter, and fluid viscosity. Consult Cytiva for application-specific recommendations.

Microfiltration

Improper start-up of high-flux microfiltration membranes can result in rapid gel layer formation leading to a decline in flux. During startup, close both permeate tubing valves so that you can establish the cross flow velocity as needed. If possible, circulate water or buffer solution initially to obtain the proper cross flow velocity. Then introduce your product solution.

During processing, aim to maintain a minimum inlet pressure of less than 0.7 barg (10 psig), given the constraints of the recommended recirculation rates and the feed pump characteristics. Low inlet pressures will help prevent pore plugging by small particulates or cell fragments. Retentate pressure should be approximately 0 barg (0 psig).

Once you establish the desired cross flow rate, begin permeate withdrawal by fully opening the permeate tubing valve. If you observe rapid flux decline, throttle the permeate tubing valve on subsequent trials to create backpressure in the permeate line. Controlling permeate flow rate can stabilize flux and improve long-term system productivity. Experts recommend this technique, called permeate flow control, for all microfiltration separations, particularly when using membrane rated at 0.45 and 0.65 microns.

10 Complete Post Processing Steps

Post-Use Integrity Testing

You should test the integrity of your cartridge after using it. Integrity testing confirms there were no internal leaks in the cartridge during processing. Refer to the *Cytiva Integrity Test Procedure Guide* for hollow fiber cartridges to learn how to test the integrity of microfiltration and ultrafiltration membranes.

Disposal

Dispose of your ReadyToProcess hollow fiber cartridge in accordance with the government and environmental regulations that pertain to your location.

11 Safety Precautions

Before using your ReadyToProcess hollow fiber cartridge, you should read and understand these safety precautions:

- Do not operate your hollow fiber cartridge at a pressure higher than its design pressure.
- Typically, the maximum pressure rating of other components in your system is lower than the pressure rating of hollow fiber cartridges. Do not operate your system at a pressure that exceeds the maximum pressure rating of the lowest-rated component in your system.

12 Related Literature

Some ReadyCircuit components require you to follow specific care and use procedures. If you cannot find the information you need in this user guide, consult the following related literature available from Cytiva.

Data files

	Product code
ReadyCircuit bags and tubing assemblies	28960644
ReadyKart mobile processing station	28960648
ReadyToProcess hollow fiber cartridges	28922683
Sterile ReadyToProcess ULTA NFF capsules	28925793
ReadyMate disposable aseptic connectors	28937902

Instructions for use

	Product code
ReadyCircuit bags, tubing assemblies, and filters	28960646
ReadyKart mobile processing station	28960647
Sterile RTP hollow fiber cartridges	28922684
Sterile ReadyToProcess ULTA NFF capsules	28960822
ReadyMate disposable aseptic connectors	28938570
ReadyClamp	28940620

Quick reference guides

	Product code
ReadyCircuit components	28975067
ReadyKart mobile processing station	28975072
ReadyToProcess CFF cartridge	28977640

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