User Guide

Amicon® Stirred Cells

Cat. No. UFSC05001, 50 mL

UFSC20001, 200 mL

UFSC40001, 400 mL

Notice

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Introduction

Amicon® Stirred Cells are designed for rapid concentration and/or diafiltration of macromolecular solutions. Used in conjunction with an external compressed gas source and a magnetic stirrer, the stirred cells provide high concentration factors and high sample recovery. They are ideal for desalting or buffer exchange applications and can be used in either continuous or discontinuous diafiltration mode.

Amicon® Stirred Cell Features

- Pressure-driven filtration coupled with magnetic stirring provides a gentle method for concentration and reduces shear-induced denaturization of biological samples.
- Magnetic stirrer positioned at the filtration interface greatly minimizes the risk of concentration polarization and subsequent fouling of the membrane.
- Three sizes offer a broad range of process volumes (up to 400 mL) that can be further expanded with the addition of an external reservoir.
- The flexible, easy-to-use design can accommodate a wide range of ultrafiltration and microporous membranes at varying pressures and temperatures.
- Minimal holdup volume and easy sample recovery.
- Autoclavable for sterile applications.

Models Available

Catalogue Number	Maximum Working Volume	Membrane Diameter
UFSC05001	50 mL	44.5 mm
UFSC20001	200 mL	63.5 mm
UFSC40001	400 mL	76 mm

NOTE: Minimum concentrate volume must be determined empirically by the user since it depends on sample composition and stirring speed.

Operating Modes

Stirred cells can be operated in either a concentration or diafiltration mode. In concentration mode, gas pressure is applied directly to the stirred cell. Solutes larger than the membrane's molecular weight cutoff (MWCO)/pore size are retained in the cell, while water and solutes smaller than the MWCO/pore size pass through the membrane into the filtrate.

Diafiltration is a fast and efficient technique for desalting as well as buffer exchange of solutions. It can be performed in a batch (discontinuous) or constant volume (continuous) mode.

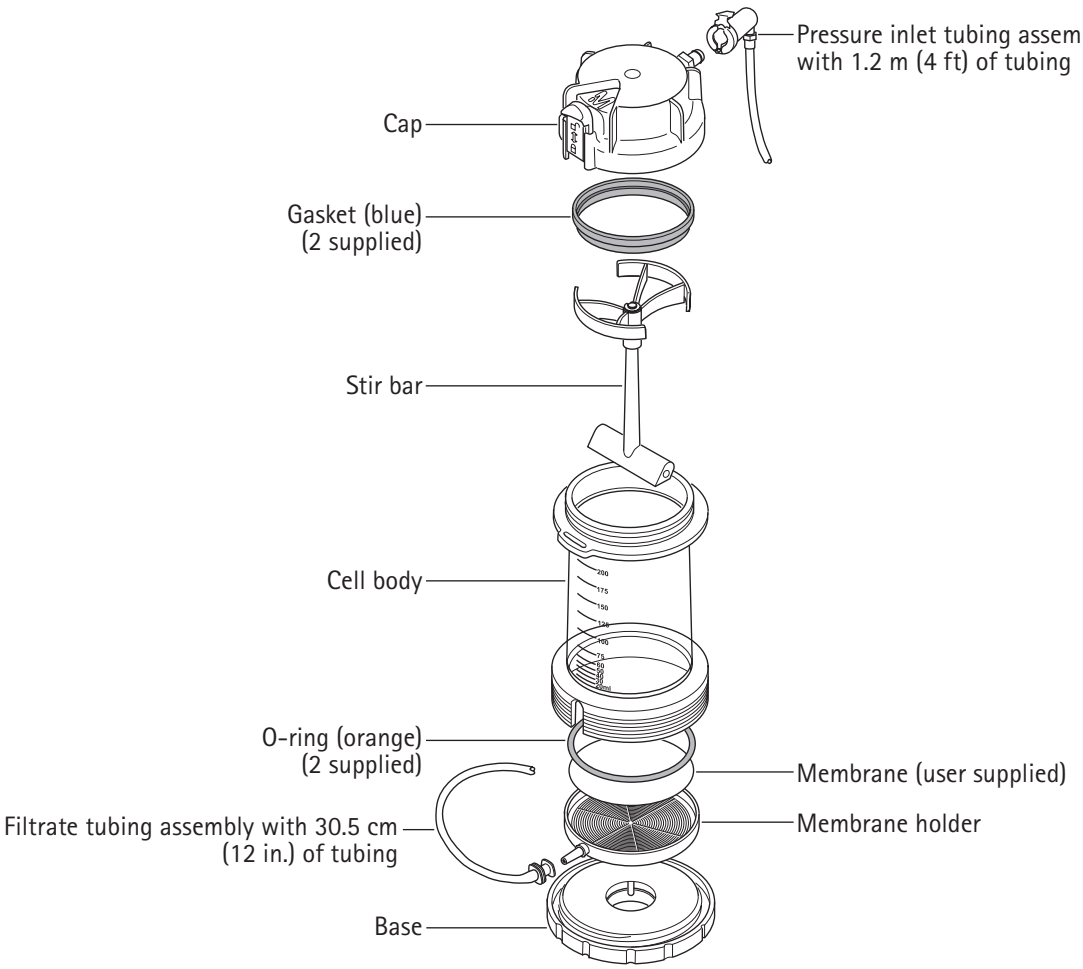
Discontinuous Diafiltration: The sample is first concentrated to a fixed volume, then diluted back to its original starting volume with water or buffer. Conversely, the sample can be diluted to a fixed volume with water or buffer, then concentrated back to its original volume. Either process is repeated until the remaining salt or solvent is removed or lowered in concentration.

Operating Modes, continued

Continuous Diafiltration: Buffer salts are removed, exchanged, or lowered by adding water or exchange buffer at the same rate as the filtrate is collected. Continuous diafiltration is gentler and more efficient than discontinuous diafiltration, as it maintains product stability by keeping the sample concentration and volume constant during diafiltration.

The Amicon® Stirred Cell Reservoir (cat. no. 6028) or Dispensing Pressure Vessel (cat. no. XX6700P01) can be used for diafiltration applications and to increase the volume capacity of the stirred cells. In continuous diafiltration mode, the reservoir/pressure vessel containing diafiltration solution is connected to the stirred cell and gas pressure supply via the Amicon® Stirred Cell Selector Valve (cat. no. 6003) or similar user-supplied valve(s). The selector valve allows instant switching between concentration and diafiltration modes without interrupting system operation. The combination of an external reservoir and the Amicon® Selector Valve create a simple diafiltration system that keeps the stirred cell fluid volume and macrosolute concentration constant as the filtrate volume is replaced by the diafiltration solution. In either mode, the Amicon® Stirred Cell Manifold (cat. no. 6015) can be used to operate multiple stirred cells in parallel.

Amicon® Stirred Cell Components



Materials Required but Not Supplied

- Ultrafiltration or microfiltration membrane discs
- Magnetic stirrer
- Source of clean, regulated, compressed air or nitrogen with tube fittings/connectors appropriate for connecting to ¼ in. outer diameter (OD) tubing at the desired operating pressure
- Collection containers

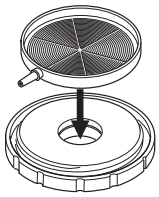
Pressure Limitation

Do not operate the stirred cell above 5.2 bar (75 psi).

Assembly and Operation

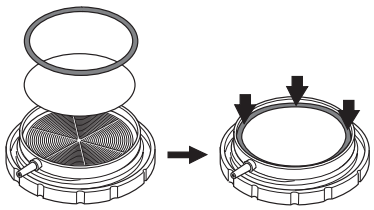
Concentration Mode

1. Snap membrane holder onto base.

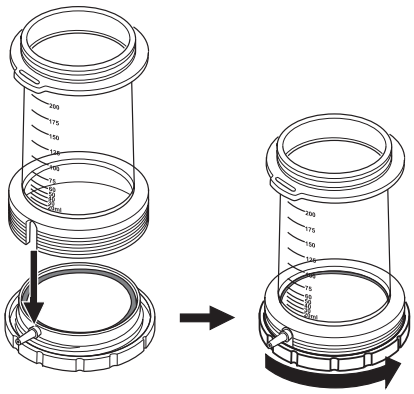


2. Place membrane into membrane holder, oriented as indicated in membrane instructions (shiny side up for ultrafiltration membranes). Place O-ring on top of membrane and push down gently to seat membrane in holder.

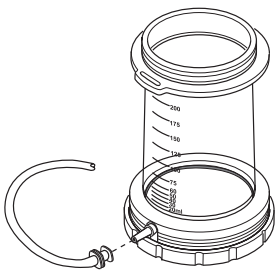
   NOTE: See membrane instructions for rinsing and chemical compatibility. Handle membrane by edge to avoid scratching or contaminating surface.



3. Align filtrate port on membrane holder with slot in bottom of cell body. Screw base into cell body.

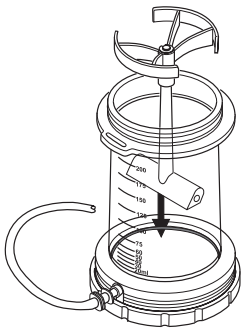


4. Attach filtrate tubing assembly to filtrate port on membrane holder.

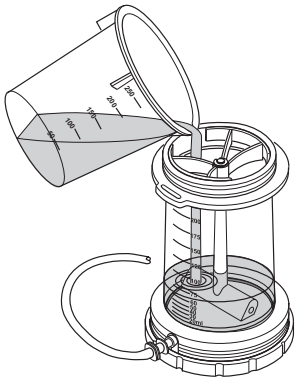


Concentration Mode, continued

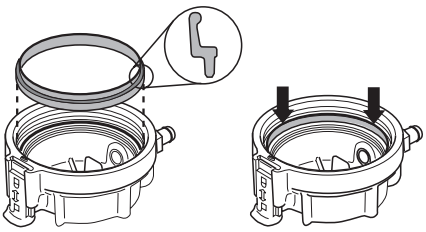
5. Insert stir bar into cell body until support ring is seated on ridge inside the top of cell body.



6. Pour desired sample into cell.

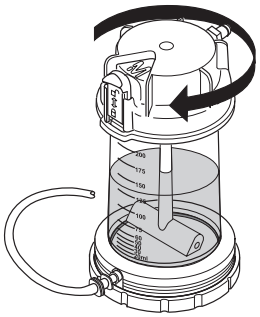


7. With cap oriented as shown, seat large diameter of gasket in gasket groove. Gently push the gasket down to seat it fully.

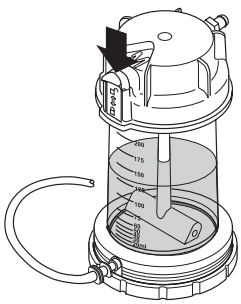


IMPORTANT! To avoid leakage between cap and cell body, make sure that the gasket is free of dirt/debris and oriented correctly in the cap.

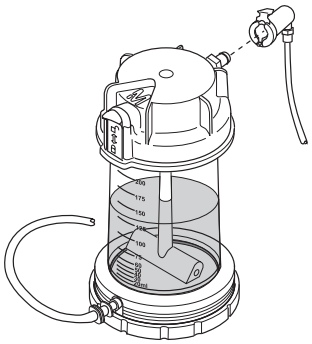
8. Screw cap onto cell body until it stops.



9. Move blue slide-lock downward to close pressure relief valve and lock cap in place.

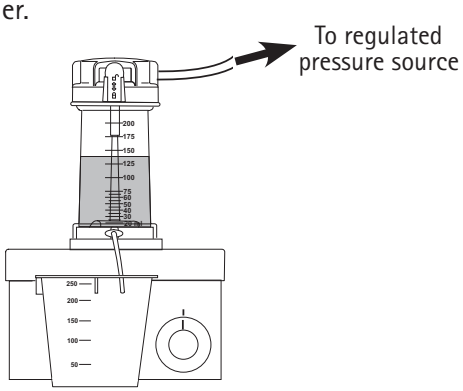


10. Attach pressure inlet tubing assembly by inserting female connector onto quick-connect fitting on cap until it clicks.



Concentration Mode, continued

11. Place stirred cell on magnetic stirrer and insert filtrate tubing into an appropriate collection container.



12. To concentrate, connect free end of the ¼ in. OD pressure inlet tubing to a regulated pressure source.

    To increase the volume capacity of the stirred cell using the Amicon® Stirred Cell Reservoir and Amicon® Stirred Cell Selector Valve, refer to the setup described in Diafiltration Mode.

    NOTE: Use clean compressed air or nitrogen gas for pressurizing the cell. With sensitive solutions, compressed air can cause large pH shifts, due to dissolution of carbon dioxide. Oxidation may also occur.

    WARNING: Do not exceed pressure limit of 5.2 bar (75 psi).

13. Initiate stirring and pressurize stirred cell to desired pressure. Refer to membrane instructions for optimal operating pressures.

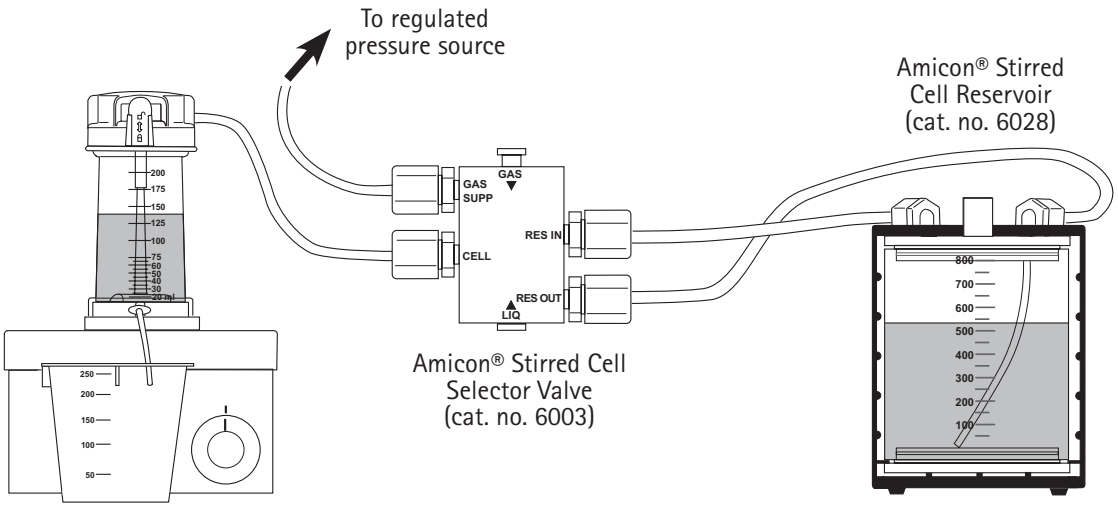
    NOTE: Ensure that stir bar is not touching the membrane surface. For unsupported membranes, pressurize stirred cell prior to stirring.

14. Collect filtrate until desired concentration factor is achieved.

Diafiltration Mode

For discontinuous (batch) diafiltraton, concentrate to a desired level then dilute back to the starting volume. Repeat this process until the remaining salt or solvent is removed or lowered in concentration.

For continuous (constant volume) diafiltration, connect the stirred cell to an external reservoir (e.g., cat. no. 6028), via the Amicon® Stirred Cell Selector Valve (cat. no. 6003), or similar user-supplied valve(s) to control gas and liquid output independently. The selector valve can be used to switch instantly between concentration and diafiltration modes without interrupting system operation. Refer to corresponding user guides for detailed instructions.



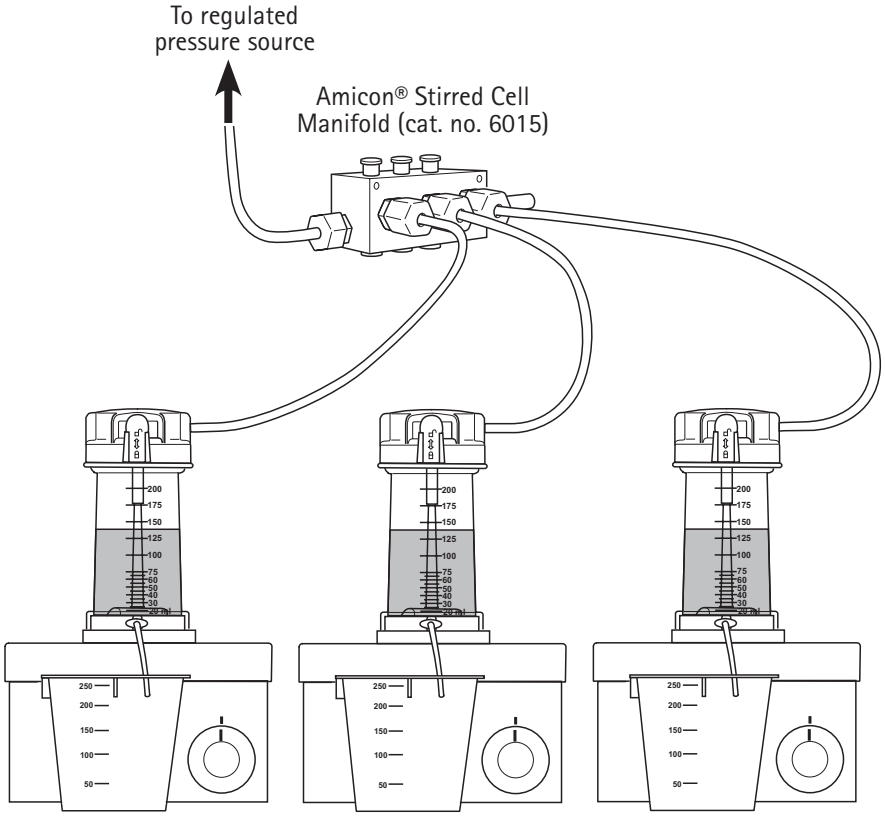
Diafiltration Mode, continued

NOTE: During continuous diafiltration, the pressure should not exceed 3.8 bar (55 psi), in order to maintain equilibrium between the stirred cell and the reservoir. If the liquid level increases slightly, concentrate briefly.

WARNING: To prevent fluid from entering the stirred cell pressure relief valve during continuous diafiltration, do not exceed the maximum working volume (e.g., 50 mL for the 50 mL stirred cell).

Operating Multiple Cells in Concentration or Diafiltration Mode

In either mode, an Amicon® Stirred Cell Manifold (cat. no. 6015) can be used to operate multiple stirred cells in parallel. Refer to the manifold user guide for detailed instructions.



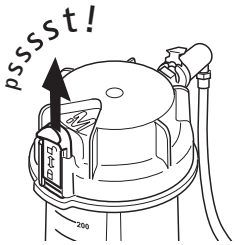
Shut down and disassembly

1. Once filtration is complete, turn off pressure at the source, then turn off magnetic stirrer.

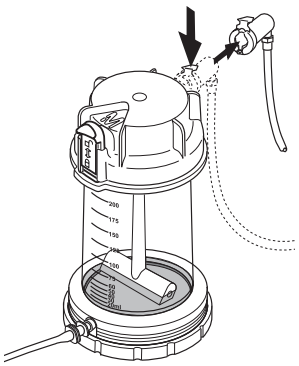
   WARNING: Do not disconnect pressure inlet tube until stirred cell is depressurized.

   NOTE: To maximize recovery of retained substances, continue stirring for a few minutes after depressurization to resuspend the polarized layer at the membrane surface.

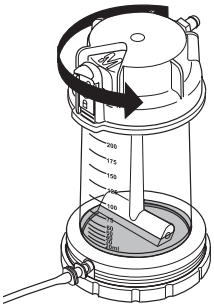
2. Move blue slide-lock upward to vent residual pressure and disengage cap lock.



3. Disengage the quick-connect fitting by pressing down on the metal tab and pulling the fitting away from the cap.



4. Unscrew cap and remove from cell body.



5. Remove stir bar and recover concentrated sample. Save filtrate sample if required.

Troubleshooting

Symptom	Cause	Corrective Action
Inaccurate volume estimate from volume markings on cell body	Stir bar not in place	Place stir bar in cell when using graduation marks to estimate volume remaining in cell.
Poor coupling of stir bar	Stir bar hitting the membrane surface	Check stir bar to ensure that it is not in contact with the membrane surface. For unsupported membranes, pressurize stirred cell prior to stirring.
	Stir bar has metal debris attached to it	Inspect bottom of stir bar for debris.
	Stir bar rattling/wobbling	Ensure stir bar support ring is properly seated on the ridge at the top of the cell. Make sure stirred cell is centered on the magnetic stirrer. Start stirring at low speed, then slowly increase speed to desired level. Inspect stir bar support ring for damage/wear and dirt/debris.
Cannot pressurize stirred cell OR Stirred cell does not hold pressure	Blue slide-lock is not fully in place, so relief valve is not completely closed	Ensure cap is screwed on completely to align blue slide-lock correctly, then push slide-lock downward to close relief valve.
	Leak at pressure inlet tubing assembly	Make sure female connector is properly inserted onto quick-connect fitting. Check pressure inlet tubing for damage or wear.
	Crazing/cracking or damage to stirred cell components	Inspect all parts for damage/wear prior to use. Do not exceed maximum autoclave conditions. Do not use incompatible samples or cleaning agents.
	Leaking/hissing from around the cap	Make sure gasket is oriented properly in the cap and is free of damage/wear and dirt/debris. Make sure stir bar support ring is fully seated on ridge inside top of cell body.
Little or no filtrate obtained	No pressure from gas source	Check for pressure at the gas source and regulator.
	Pressure applied not sufficient	Refer to pressurization issues above. Refer to membrane instructions for optimal operating pressure.
	Wrong membrane type, MWCO, or pore size	Choose an appropriate membrane type and MWCO/pore size for the specific sample.
	Membrane not oriented correctly	Orient membrane disc according to membrane instructions, typically shiny side up for ultrafiltration membranes.
	Highly viscous sample	Dilute to decrease viscosity.
	Sample contains particulate matter	Prefilter or centrifuge samples containing particulate matter such as cell debris or precipitates.
	Blockage at filtrate port	Check membrane holder and filtrate port for blockage.

Troubleshooting, continued

Symptom	Cause	Corrective Action
Poor concentrate recovery	Membrane not sealed, resulting in sample bypass around the membrane	Make sure O-ring is free of dirt/debris and undamaged. Make sure O-ring rests entirely on the peripheral surface of the membrane and has not been squeezed out of its slot. Ensure that membrane disc is perfectly round and is the appropriate diameter for the stirred cell. Make sure membrane lies flat (no wrinkles or folds) on the membrane holder.
	Sample of interest goes through the membrane	Choose an appropriate membrane type and MWCO/pore size for the specific sample. Inspect membrane for damage.
	Sample leaking through base	Ensure base is sufficiently tightened.
Poor concentrate quality	Sample degraded or precipitated	Maintain an appropriate stirring speed for the sample, so that it does not denature (protein samples). Do not over-concentrate sample.
	Sample contaminated	Thoroughly clean and rinse stirred cell after each use. Handle membranes according to membrane instructions.
	Fouling of membrane	Engage the stir bar and maintain an appropriate stirring speed for the sample. Do not concentrate without stirring. Use an appropriate operating pressure for the sample and membrane type in use.
	Sample dried onto membrane	Monitor filtration process and stop when the desired concentration is reached.
Liquid expelled from cap pressure relief valve during venting	Insufficient drying of cap after cleaning	Dry cap completely prior to use.
	Sample volume exceeded maximum working volume and liquid got into cap	Do not exceed maximum working volume.
Cannot open the stirred cell	Slide-lock still engaged	Turned off pressure at the source, then vent residual pressure by moving the blue slide-lock upward.

Cleaning, Maintenance, and Storage

- After each use, the stirred cell and all fluid-carrying tubing should be cleaned with mild laboratory detergent and rinsed with deionized water.
- Replace O-ring and gasket at the first sign of damage or wear.
- Periodically inspect the cell body for cracks and inspect the stir bar for washer wear or rough edges which could damage the membrane.

  WARNING: Do not use stirred cell if cell body is cracked or crazed.
- Disassemble the stirred cell whenever it is unlikely to be used for several weeks.
- Store all components at room temperature.

Sterilization/Sanitization

Amicon® Stirred Cells are compatible with standard sterilizing gas mixtures. They can also be autoclaved for at least 10 cycles at 121 °C, 1 bar (250 °F, 15 psi) for 30 minutes, with slow exhaust cycle. However, due to variables beyond our control, no warranty is provided or implied for more than 10 autoclave cycles. The pressure inlet tubing assembly is **NOT** autoclavable.

WARNING: To avoid damage to the cell body, the base and cap should be only partially tightened before autoclaving.

To sanitize, use 70% ethanol or isopropanol. To disinfect, use 5% formalin.

Chemical Compatibility

Do not use the stirred cell with strong acids or bases (pH < 2 or > 10), ketones (including acetone), aromatic hydrocarbons (including toluene), Cellosolve® solvent, halogenated hydrocarbons, dimethyl formamide, aliphatic esters, dimethyl sulfoxide, and polar aromatics.

For other solvent compatibilities, consult a standard text or contact Technical Service. For the chemical resistance of disc membranes, refer to product instructions.

Specifications

Catalogue Number	UFSC05001	UFSC20001	UFSC40001
Maximum working volume	50 mL	200 mL	400 mL
Hold-up volume without tubing (non-recoverable volume below membrane surface)	< 0.5 mL	< 1.0 mL	< 1.25 mL
Membrane diameter	44.5 mm	63.5 mm	76 mm
Effective membrane area	13.4 cm^2 (2.1 in^2)	28.7 cm^2 (4.4 in^2)	41.8 cm^2 (6.5 in^2)
Empty weight (without pressure inlet tubing)	160 g (5.6 oz)	265 g (9.3 oz)	390 g (13.8 oz)
Overall height	11.7 cm (4.6 in.)	15.5 cm (6.1 in.)	18.7 cm (7.4 in.)
Base diameter	6.6 cm (2.6 in.)	8.4 cm (3.3 in.)	9.9 cm (3.9 in.)
Tubing — Filtrate	5/32 in. (4.0 mm) OD × 3/32 in. (2.4 mm) ID ×12 in. (30.5 cm)		
Tubing — Pressure	1/4 in. (6.4 mm) OD × .17 in. (4.3 mm) ID × 4 ft (1.2 m)		
Maximum operating pressure	5.2 bar (75 psi)		
Maximum diafiltration operating pressure	3.8 bar (55 psi)		
Working temperature range	4–40 °C (39–104 °F)		
Materials of Construction			
Cap, stir bar, body, membrane holder	Polysulfone		
Gasket, O-ring	Silicone		
Base, stir bar support,	Acetal		
Stir bar retaining ring, washer	316 stainless steel		
Filtrate tubing	Tygon® E-3603 tubing		
Luer connector on filtrate tubing	Nylon		
Pressure tubing	Polyethylene		

Statement Regarding Compliance with the Pressure Equipment Directive 97/23/EC

EMD Millipore Corporation certifies that this product complies with the European Pressure Equipment Directive, 97/23/EC of 29 May 1997. This product is classified under Article 3 § 3 of the Pressure Equipment Directive. It has been designed and manufactured in accordance with sound engineering practices to ensure safe use. The product is accompanied by user instructions and bears markings to permit identification of EMD Millipore Corporation as the manufacturer or authorized representative of this product within the European Community. In compliance with Article 3 § 3 of the Pressure Equipment Directive, this product does not bear the CE mark.

Ordering Information

This section lists catalogue numbers for the Amicon® Stirred Cells, replacement parts, and accessories. See Technical Assistance section for contact information. You can purchase these products on-line at www.millipore.com/amiconstirredcell.

Product Description	Cat. No.	Qty/Pk
Amicon® Stirred Cell, 50 mL	UFSC05001	1
Seal Kit (3 O-rings and 3 gaskets)	UFSC050SL	1
Maintenance Kit (1 stir bar assembly, 2 gaskets, 1 tubing kit)	UFSC050MT	1
Amicon® Stirred Cell, 200 mL	UFSC20001	1
Seal Kit (3 O-rings and 3 gaskets)	UFSC200SL	1
Maintenance Kit (1 stir bar assembly, 2 gaskets, 1 tubing kit)	UFSC200MT	1
Amicon® Stirred Cell, 400 mL	UFSC40001	1
Seal Kit (3 O-rings and 3 gaskets)	UFSC400SL	1
Maintenance Kit (1 stir bar assembly, 2 gaskets, 1 tubing kit)	UFSC400MT	1
Accessories		
Amicon® Stirred Cell Selector Valve For instant switching from concentration to diafiltration. Includes selector valve, tube fittings, tubing.	6003	1
Amicon® Stirred Cell Manifold For operation of multiple cells or reservoirs; individually valved. Includes manifold, tube fittings, tubing, mounting hardware.	6015	1
Amicon® Stirred Cell Reservoir Provides 800 mL extra fluid volume; can be used for diafiltration. Includes reservoir, tube fittings, tubing.	6028	1
Dispensing Pressure Vessel, 1 gal	XX6700P01	1
Dispensing Pressure Vessel, 5 L	XX6700P05	1
Dispensing Pressure Vessel, 10 L	XX6700P10	1
Dispensing Pressure Vessel, 20 L	XX6700P20	1
Dispensing Pressure Vessel Fitting Kit	XX67000PK	1

Technical Assistance

For more information, contact the office nearest you. In the U.S., call 1-800-221-1975. Outside the U.S., go to our web site at www.millipore.com/offices for up-to-date worldwide contact information. You can also visit the tech service page on our web site at www.millipore.com/techservice.

Standard Warranty

The applicable warranty for the products listed in this publication may be found at www.millipore.com/terms ("Conditions of Sale").