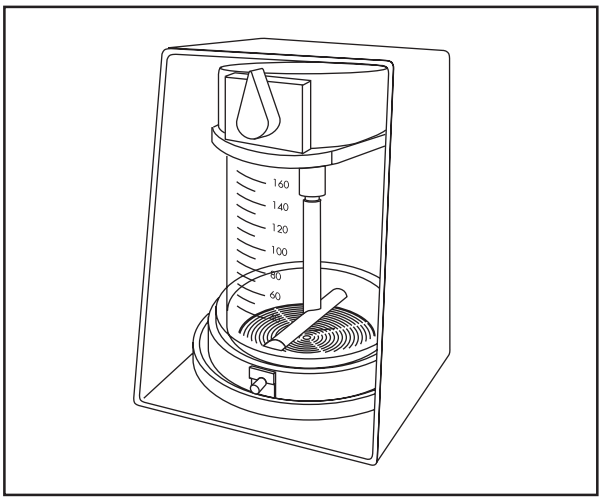
Stirred Ultrafiltration Cells

Models 8003, 8010, 8050, 8200, 8400

User Guide



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99228, Rev. K, 10/04

Contents

Introduction

Millipore stirred ultrafiltration cells are designed for rapid concentration or purification of macromolecular solutions in volumes from 3 to 400 mL. All models are used in conjunction with a stirring table. The table is magnetically coupled to a stirring bar, which maintains fluid movement during operation, thereby reducing the negative effects of concentration polarization (i.e., the buildup of concentrated solutes on the membrane).

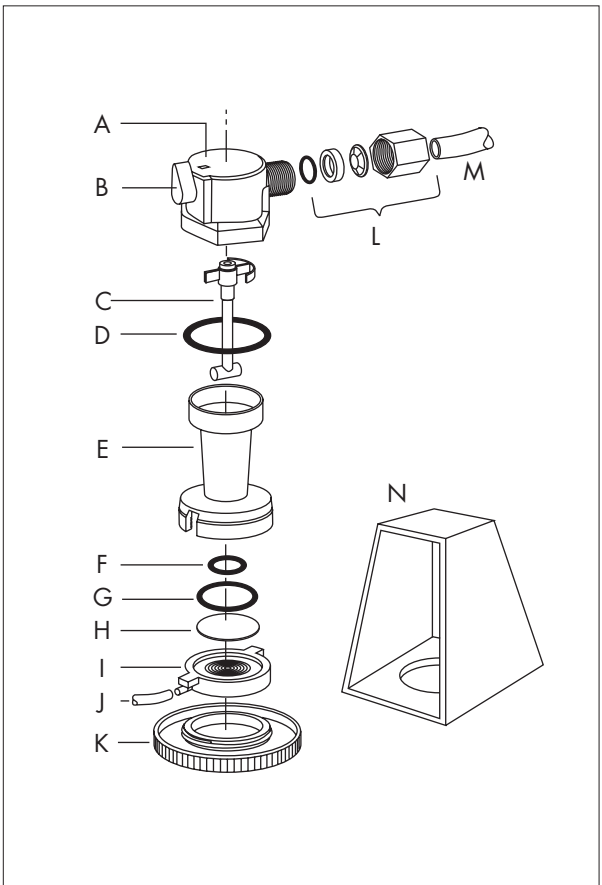
Models Available

Model	Capacity	Millipore Cat. No.
8003	3 mL	5125
8010	10 mL	5121
8050	50 mL	5122
8200	200 mL	5123
8400	400 mL	5124

Safety Features

- Cell has a built-in pressure-relief valve, preset to nominal 75 psi (5.3 kg/cm^2). The recommended operating pressure is <55 psi (3.9 kg/cm^2).
- Cell remains fixed in the retaining stand until the pressure-relief valve is opened and the cap depressed.
- Stand provides a large base for improved cell stability.

Model 8003 Parts List

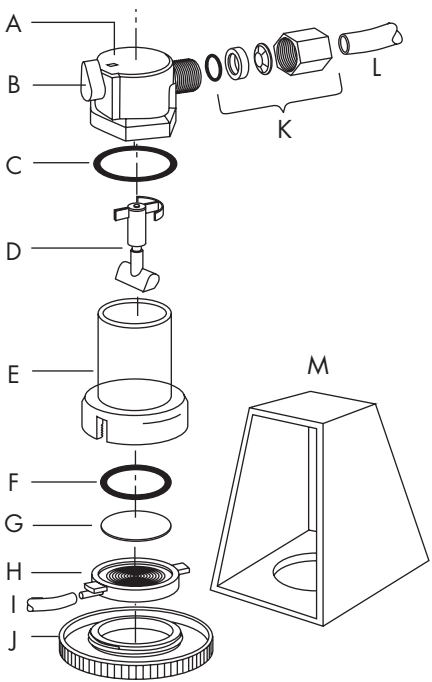


Model 8003 Parts List, continued

Item No.	Description	Quantity Supplied	Replacement Catalogue Number
A	Cap Assembly	1	1524901
B	Pressure Relief Valve	—	
C	Stirrer Assembly	1	1570801
D	O-Ring	2	2122S
E	Body	1	1532705
F	O-Ring	2	2015S
G	O-Ring	2	2118S
H	Membrane	—	
I	Membrane Holder	1	2214801
J	Elastomeric Tubing[1]	4 in.	14-169-1C (Fisher Cat. No.)
K	Base	1	21000
L	Tube Fitting Assembly	2	15025AM
M	Tubing, Plastic	4 ft	XXPE00010
N	Stand Assembly	1	1570901

[1] You can also use Tygon® clear laboratory tubing formula R-3603, I.D. 3/32 in. (2.4 mm), O.D. 5/32 in. (4 mm).

Model 8010 Parts List

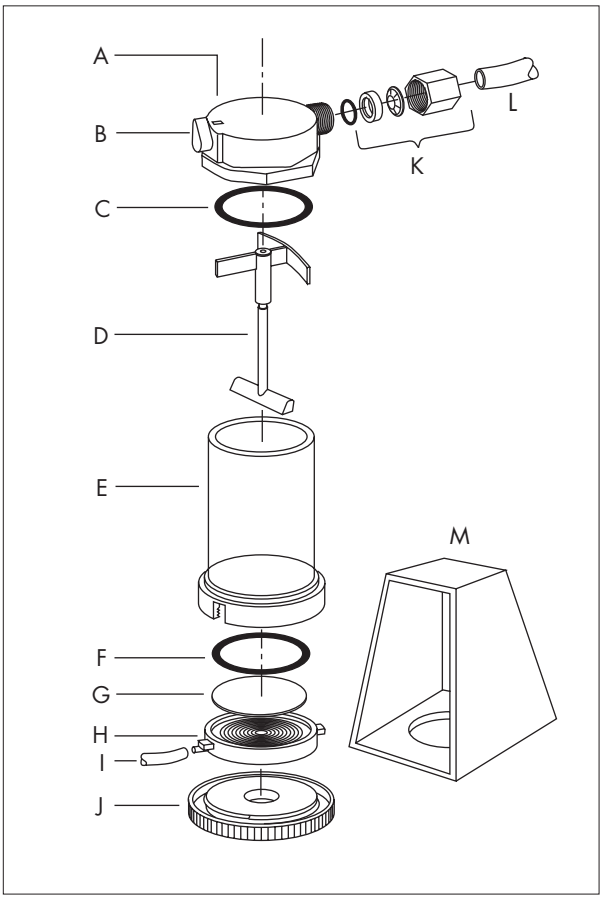


Model 8010 Parts List, continued

Item No.	Description	Quantity Supplied	Replacement Catalogue Number
A	Cap Assembly	1	1524901
B	Pressure Relief Valve	—	
C	O-Ring	2	2122S
D	Stirrer Assembly	1	15247
E	Body	1	1532701
F	O-Ring	2	2118S
G	Membrane	—	
H	Membrane Holder	1	20998
I	Elastomeric Tubing[1]	4 in.	14-169-1C (Fisher Cat. No.)
J	Base	1	21000
K	Tube Fitting Assembly	2	15025AM
L	Tubing, Plastic	4 ft	XXPE00010
M	Stand Assembly	1	1532001

[1] You can also use Tygon clear laboratory tubing formula R-3603, I.D. 3/32 in. (2.4 mm), O.D. 5/32 in. (4 mm).

Model 8050 Parts List

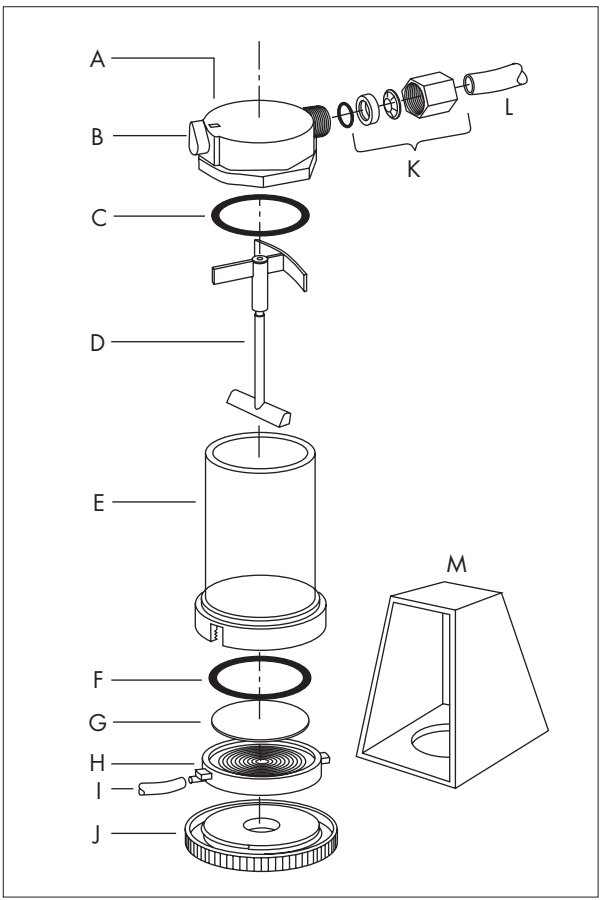


Model 8050 Parts List, continued

Item No.	Description	Quantity Supplied	Replacement Catalogue Number
A	Cap Assembly	1	1524902
B	Pressure Relief Valve	—	
C	O-Ring	2	2132S
D	Stirrer Assembly	1	15251
E	Body	1	1532702
F	O-Ring	2	2130S
G	Membrane	—	
H	Membrane Holder	1	21117
I	Elastomeric Tubing[1]	4 in.	14-169-1C (Fisher Cat. No.)
J	Base	1	20987
K	Tube Fitting Assembly	2	15025AM
L	Tubing, Plastic	4 ft	XXPE00010
M	Stand Assembly	1	1532002

[1] You can also use Tygon clear laboratory tubing formula R-3603, I.D. 3/32 in. (2.4 mm), O.D. 5/32 in. (4 mm).

Model 8200 Parts List

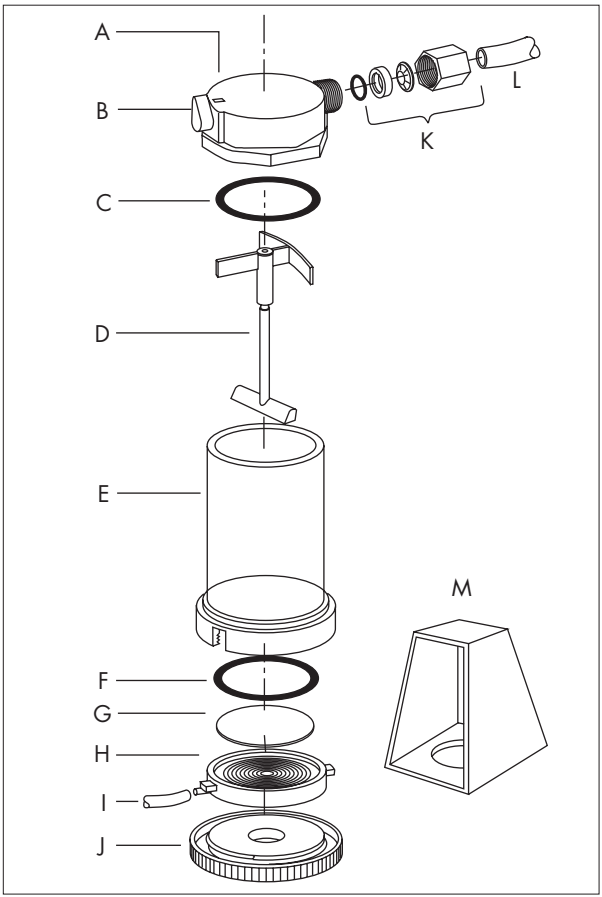


Model 8200 Parts List, continued

Item No.	Description	Quantity Supplied	Replacement Catalogue Number
A	Cap Assembly	1	1524903
B	Pressure Relief Valve	—	
C	O-Ring	2	2143S
D	Stirrer Assembly	1	15256
E	Body	1	1532703
F	O-Ring	2	2142S
G	Membrane	—	
H	Membrane Holder	1	21005
I	Elastomeric Tubing[1]	4 in.	14-169-1C (Fisher Cat. No.)
J	Base	1	21011
K	Tube Fitting Assembly	2	15025AM
L	Tubing, Plastic	4 ft	XXPE00010
M	Stand Assembly	1	1532003

[1] You can also use Tygon clear laboratory tubing formula R-3603, I.D. 3/32 in. (2.4 mm), O.D. 5/32 in. (4 mm).

Model 8400 Parts List



Model 8400 Parts List, continued

Item No.	Description	Quantity Supplied	Replacement Catalogue Number
A	Cap Assembly	1	1524904
B	Pressure Relief Valve	—	
C	O-Ring	2	2151S
D	Stirrer Assembly	1	15254AM
E	Body	1	1532704
F	O-Ring	2	2150S
G	Membrane	—	
H	Membrane Holder	1	21118
I	Elastomeric Tubing[1]	4 in.	14-169-1C (Fisher Cat. No.)
J	Base	1	21003
K	Tube Fitting Assembly	2	15025AM
L	Tubing, Plastic	4 ft	XXPE00010
M	Stand Assembly	1	1532004

[1] You can also use Tygon clear laboratory tubing formula R-3603, I.D. 3/32 in. (2.4 mm), O.D. 5/32 in. (4 mm).

Operating Modes

Stirred ultrafiltration cells can be operated in two modes: concentration and diafiltration.

Concentration

In this mode, apply gas pressure directly to the ultrafiltration cell. Solutes above the membrane molecular weight cut-off are retained in the cell, while water and solutes below the cut-off pass into the filtrate and out of the cell.

Diafiltration

Connect the ultrafiltration cell to an auxiliary reservoir (Millipore cat. no. 6028) containing a diafiltrate solution with the desired microsolute concentration. The use of stirred cells in the diafiltration mode also requires use of the CDS-10 Concentration/Dialysis Selector (Millipore cat. no. 6003). The combination of the auxiliary reservoir and the CDS-10 selector form a system that keeps the stirred cell fluid volume and macrosolute concentration constant as the filtrate volume is replaced by the diafiltrate solution. This technique provides a simple means for rapid microsolute exchange, and is typically used as a substitute for dialysis.

Unpacking the System

Place cell on a level surface and remove packing inserts. Turn the pressure relief valve knob to the horizontal position. Hold the body and push the cap down. Slide the cell out of the retaining stand and remove the cap assembly with a twisting motion. Pull out the stirrer assembly and discard packing. Unscrew the base and remove the membrane holder. Remove the O-ring from the membrane holder.

Setting Up the System

To identify the parts of the stirred cell, refer to the diagrams in the appropriate model parts list section. This section explains how to install the membrane and stirring assembly.

Membrane Installation

NOTE: Handle the membrane by its edges, to avoid scratching or contaminating the surface.

1. **Model 8003 only:**
   Invert the cell body and place the smaller membrane holder O-ring (Model 8003 Parts List — F) into the recess. Gently tap to ensure that the O-ring remains when the body is upright. Place the membrane into the holder, shiny side up. Then place the larger membrane holder O-ring (Model 8003 Parts List — G) down, so that it contacts and seats the membrane evenly in the bottom of the holder.

   All other models (8010, 8050, 8200, and 8400):
   Place the membrane into the holder, shiny side up. Place the O-ring on top of the membrane. Gently push the O-ring down, so that it contacts and seats the membrane evenly in the bottom of the holder.

2. Fit the membrane holder into the cell body, aligning the tabs on the sides of the holder with the slots in the base of the cell body.

3. Invert the cell body and membrane holder; screw the base firmly into the bottom of the cell body.

4. Push the filtrate exit tubing onto the exit spout of the membrane holder.

Stirrer Assembly Installation

1. Place the stirrer assembly into the cell body. When properly installed, the arms of the stirrer assembly will rest on the small ridge inside the top of the cell body.
2. Pour the sample into the cell.
3. Push the cap assembly down onto the cell body, using a twisting motion and orienting the gas inlet port on the cap opposite the filtrate exit port on the holder.

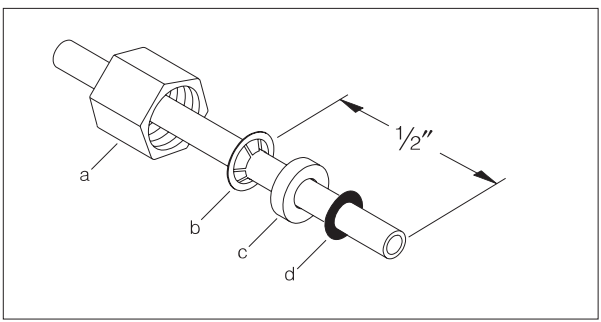
   NOTE: If the cap assembly does not slide easily, lubricate the O-ring lightly with water or petroleum jelly. Do not allow petroleum jelly to contact the membrane, to avoid clogging the membrane pores.

4. Set the pressure-relief valve knob to the horizontal (open) position.
5. Slide the cell into the retaining stand, fitting the ring on the cell base into the hole in the stand. The flattened edge on the bottom flange of the cap ensures that the cell is inserted properly and prevents rotation of the cell once inside the stand.
6. Turn the pressure-relief valve knob to the vertical (closed) position.

Gas Pressure Line Installation

Attach the gas pressure line to the tube fitting on the cap as follows:

1. Unscrew the hexagonal nut (a) from the cap assembly and remove the O-ring (d).



2. Slide the hex nut onto the end of gas tubing.
3. Slide the metal grab ring (b) down one half-inch onto the tubing, with the flange facing away from the hex nut.
4. Add the white spacer (c), positioning the countersunk surface toward the flange on the grab ring.
5. Slide the O-ring (d) onto the end of the tubing.
6. Insert the exposed tubing into the cap assembly and hand-tighten the hexagonal nut. **Do not overtighten.**

Operating Guidelines

- See membrane instructions for cleaning and storage procedures, and for buffer and solvent compatibility.
- Highly viscous solutions filter slowly, as do solutions containing particulate matter, such as colloids. Where a viscous agent (sucrose, glycerin, etc.) is to be removed, flow can often be increased by predilution.
- Prefilter or centrifuge any solution containing particulate matter, such as cell debris or precipitates.
- During extended diafiltration, liquid level may increase slightly. To correct, concentrate briefly.
- To maximize recovery of retained substances, continue stirring for a few minutes after depressurization. This will resuspend the polarized layer at the membrane surface.

CAUTION: Always check that the pressure-relief valve knob is set to the horizontal (open) position, before removing the cell top. Removal of the top with the pressure-relief valve knob in the vertical (closed) position can create a partial vacuum, which can rupture the membrane.

Limitations

This section explains the limitations of the stirred ultrafiltration cell.

Pressure Limits

Do not exceed 75 psi (5.3 kg/cm^2) nitrogen gas pressure.

CAUTION: To avoid the cap popping off and splattering its contents during pressurization, never operate the cell without its retaining stand.

Temperature Limits

Although brief exposure to higher temperatures is possible, do not operate cell continuously above 85 °C (185 °F).

Chemical Resistance

Do not use the stirred cell with:

Strong acids (pH < 2) or strong alkalies (pH > 10)
Ketones (including acetone)
Aromatic hydrocarbons (including toluene)
CelloSolve® solvent
Halogenated hydrocarbons
DMF
Aliphatic esters
DMSO
Polar aromatics

NOTE: The spring in the pressure-relief valve is NOT compatible with 0.1 N NaOH.

Chemical Resistance, continued

For other solvent compatibilities, consult a standard text or contact Millipore Technical Service. For the chemical resistance of disc membranes, see the instructions packed with the product.

Cell Operation

1. Select the cell operating mode as follows:

   For concentration: Connect the inlet line to a regulated gas pressure source.

   NOTE: Use nitrogen gas for pressurizing the cell. Using compressed air can cause large pH shifts, due to dissolution of carbon dioxide. With sensitive solutions, oxidation can occur also, potentially leading to other problems.

   For diafiltration: Connect the cell to an auxiliary reservoir, using the Millipore Concentration/Dialysis Selector Switch, model CDS10 (catalogue no. 6003). Contact Millipore Tech Service for detailed instructions.

2. Hold the cell steady on the laboratory bench and pressurize. Follow the instructions in the membrane package to determine optimal operating pressure. Do **NOT** exceed the cell pressure limit of 75 psi (5.3 kg/cm^2). Once the system is pressurized, the cap assembly moves upward, forming a secure lock with the retaining stand.

3. Place the cell on the magnetic stirring table.

Cell Operation, continued

4. To avoid membrane damage, before turning on the stirring table, make sure that the cell is pressurized.

   ▲WARNING: When operating with hazardous or especially valuable materials, pressure-check the cell thoroughly, to ensure that all components have been properly assembled, before turning on the stirring table.

5. Turn on the stirring table and adjust the stirring rate, until the vortex created is approximately one-third the depth of the liquid volume.

Shutting Down the System

1. Turn off the stirring table and then turn off the nitrogen pressure source.

   CAUTION: In the next step, overly rapid depressurization can cause the membrane to buckle up and rupture.

2. Slowly vent the pressure inside the cell, by turning the pressure-relief valve knob to the horizontal position. Push the cap down, and then slide the cell out from the retaining stand.

3. With a twisting motion, remove the cell cap and the magnetic stirrer assembly. Pour out the solution.

4. Disassemble the cell, wash all components with a mild detergent/water solution and rinse thoroughly.

   CAUTION: Caustic cleaning solutions may damage the retaining stand.

Sterilization

Millipore stirred ultrafiltration cells can be autoclaved at 121 °C (250 °F) for 30 minutes. They are compatible with standard sterilizing gas mixtures, 70% ethanol, isopropanol and 5% formalin. The tubing is NOT autoclavable.

CAUTION: To avoid pressure build-up in the body, which could result in damage, such as cracking, partially tighten the base before autoclaving.

Storage

Disassemble the ultrafiltration cell whenever it is unlikely to be used for several weeks.

Maintenance

- Replace O-rings at the first sign of damage or wear.
- If installation or removal of the cap assembly becomes difficult, lubricate the cap O-ring with a small amount of petroleum jelly or water.

  CAUTION: To ensure proper filtration, do not allow petroleum jelly to come in contact with the membrane.

- Periodically inspect the transparent body for cracks and inspect the stirrer bar for washer wear or rough edges, which could damage the membrane.

  CAUTION: If the transparent body is cracked or crazed, replace it immediately.

Troubleshooting

Symptom: Little or No Filtrate Obtained

- Rotate the pressure-relief valve knob to check for pressure. If the cell is not pressurized, check the nitrogen source and regulator.
- Make sure the glossy side of the disc membrane faces up.
- If the sample solution is highly viscous, due to microsolutes, either dilute or diafilter to increase flow rate.
- Check the membrane holder and filtrate port for blockage.

Symptom: Filtrate Rate Abnormally High

- Check the membrane for lesions, scratches and roughness.
- Make sure that the correct membrane type is being used.
- Make sure device is pressurized ***prior*** to placing onto magnetic stirring table.
- Check the stirrer assembly to ensure that the stirring bar is not contacting the membrane surface.

Symptom: Cell Leaks

- Be sure that the lower O-ring rests entirely on the peripheral surface of the membrane.
- Check the O-rings for nicks or cuts.
- Make sure that the membrane support is seated properly, and that the base is screwed in firmly.
- Make sure that the O-rings have not been not squeezed out of their slots.
- Check the fittings on the gas inlet tubing for correct order and position. See the Gas Pressure Line Installation section of this user guide.

Specifications

Model No.	8003	8010	8050	8200	8400
Cell capacity (mL)	3	10	50	200	400
Minimum process volume (mL)	0.075	1.0	2.5	5.0	10.0
Membrane diam. (mm)	25	25	44.5	63.5	76
Effective membrane area (cm^2)	0.9	4.1	13.4	28.7	41.8
Hold-up volume[1] (mL)	0.07	0.2	0.5	1.2	1.5
Empty weight, approx. (g)	130	130	220	360	610
Retaining stand base dimensions (cm)	6 × 6	6 × 6	7 × 7	9 × 9	11 × 11
Retaining stand height (cm)	7.7	7.7	9.8	12.8	15.5

Maximum operating pressure: 75 psi (5.3 kg/cm^2)

Relief valve setting: 90 psi (6.3 kg/cm^2)

Maximum diafiltration operating pressure: 55 psi (3.9 kg/cm^2)

[1] Non-recoverable volume (below membrane surface)

Materials of Construction

Cap: nylon

Membrane holder: polysulfone

Body: polysulfone

Magnetic stirrer assembly: acetal, polysulfone

Retaining stand: nylon

O-rings: silicone rubber

Tube fitting assembly: nylon

Compliance with the Pressure Equipment Directive, 97/23/EC

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 practice to ensure safe use.

The product is accompanied by user instructions and bears markings to permit identification of 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.

Accessory Equipment

This section lists the catalogue numbers for accessory equipment available for use with Millipore Stirred Ultrafiltration Cells. See the Technical Assistance section for information about contacting Millipore.

CDS10 Concentration/Dialysis Selector

For instant switching from concentration to rapid dialysis (diafiltration). Catalogue number 6003.

MF2 Push-Button Manifold

For operation of multiple cells or reservoirs; individually valved. Catalogue number 6015.

RC800 Reservoir

Provides 800 mL extra fluid volume. Can be used for rapid dialysis (diafiltration). Catalogue number 6028.

TA1 Tubing Adapter Kit

Adapts plastic tubing to 1/8″ or 1/4″ male or female gas fittings. Catalogue number 6022.

Technical Assistance

For more information, contact the Millipore office nearest you. In the U.S., call **1-800-MILLIPORE** (1-800-645-5476). Outside the U.S., see your Millipore catalogue for the phone number of the office nearest you or 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 http://www.millipore.com/techservice.

Standard Warranty

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