ProCulture® Spinner Flasks

Operating Instructions

4500 Series
4502 Series
4504 Series
4510 Series
4512 Series
4514 Series

CORNING
Discovering Beyond Imagination

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Contents

Technical Service and Safety Information

Technical Service

Call 800.492.1110 (outside the U.S. 001.978.635.2200), Fax 1.978.635.2476, or contact your local support office.

Safety Information for ProCulture® Glass Reservoirs

Since glass reservoirs cannot be guaranteed for any positive or negative pressure, evacuated or pressurized glass reservoirs must be shielded.

The ProCulture Spinner Flasks described in this instruction manual all include at least one glass reservoir. Glass has traditionally been the material of choice for Spinner Flasks, because it is relatively inexpensive, easy to clean, provides high visibility of reservoir contents, and is autoclavable. Many researchers sparge their vessels, or provide gas overlays to improve oxygenation of the flask medium. Even if there is no intent to pressurize a reservoir, there is the chance of accidentally pressurizing a glass reservoir during gassing if the sidearm caps are tightened or a vent filter becomes blocked. Special precautions should therefore be taken. It is not possible for a manufacturer of glass reservoirs to guarantee that its reservoirs will hold any specific positive or negative pressure without breaking.

For this reason, ProCulture® Spinner Flasks should always be shielded if gassing of the vessel is attempted. In addition, good laboratory procedure should always be followed in handling and cleaning glassware. The use of personal eye protection should be routine. See below for a full statement of limitation of liability regarding ProCulture glass reservoirs.

Caution

Corning® laboratory glass is intended for laboratory use only. The well being of individuals using these products is dependent on their proper operation, maintenance and safe laboratory practice. Refer to the owners guide, product package inserts and labels concerning warnings, safe use and operation of any Corning laboratory product.

Introduction

Welcome

Note: For optimum performance and safety, please read these instructions carefully.

Thank you for choosing the ProCulture® Spinner Flask System. By investing in this system we feel that you will get:

- Increased efficiency
- Ease of use
- Better performance with many cell lines
- State of the art cell culture capabilities

Safety Instructions

The following precautions should be followed any time you work with glass vessels. Safety Glasses should be worn at all times. Take extreme caution whenever you handle glassware, especially when washing and assembling/disassembling spinner flasks. The most damage and injuries may occur during this time. We strongly recommend that the flask is replaced if any cracks or chips appear anywhere on the vessel, center neck cap or sidearms. This will help to minimize injury, since flasks can develop micro fractures which can easily cause catastrophic failure during autoclaving or handling. Under no circumstances should the vessel be pressurized or evacuated without precautions. For more information, see page 4.

Checking Your Model Number

This manual provides instructions for assembly and operation of the following ProCulture Spinner Flasks:

4500, 4502, 4504, 4510, 4512, 4514-series

There are 6 basic styles of Corning Spinner Flasks shown below:

4500-series:
70 mm & 100 mm Center Neck Cap, Angled Sidearms

4502-series:
120 mm Center Neck Cap, Angled Sidearms

4504-series:
140 mm Center Neck Cap, Angled Sidearms

4510-100 mm, 4512-120 mm, 4514-140 mm-series:
Center Neck Cap, Vertical Sidearms

The flask style can be determined by comparing it to those shown on the next page. Any differences in assembly or operation is clearly marked in the text.

Getting Started

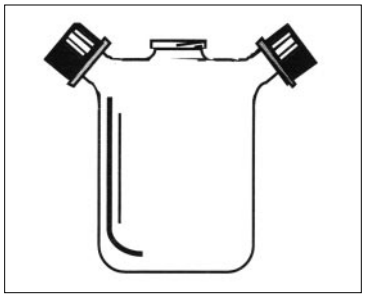


Figure 1a . Cat. No. 4500, 4502, 4504-Series

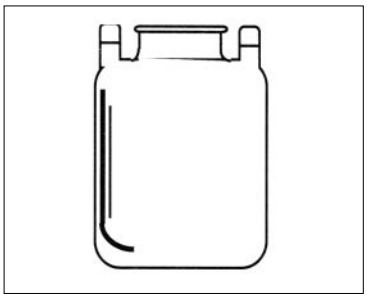


Figure 1b. Cat. No. 4510, 4512, 4514-Series

Unpacking

Note: Due to variations in flask styles, some components may be intentionally not included as indicated below:

Corning® Spinner Flasks

- **4500-Series and 4502-Series**
  - Packaged with Cap Style - a) Cap Assembly Screw Cap (Fig. 2a), Cap Style - b) Shurloc® Cap Assembly Compression Cap (Fig. 2b) is available as an option.
  - Packaged with Magnetically Driven Paddle with Polysulfone or Glass Shaft (Fig. 3a)
- **4504-Series:**
  - Packaged with Cap Style - b) Shur-Loc Cap Assembly Compression Cap (Fig. 2b)
  - Packaged with Magnetically Driven Paddle with Glass, Polysulfone or optional Stainless Steel Shaft (Fig. 3a)
- **4510, 4512, 4514-Series:**
  Packaged as flask only. Cap and Direct-Drive Paddle Assemblies (Fig. 3b) must be purchased separately. No spare parts are included.

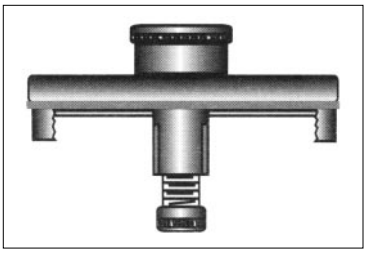


Figure 2a. Style a) Cap Assembly Screw Cap

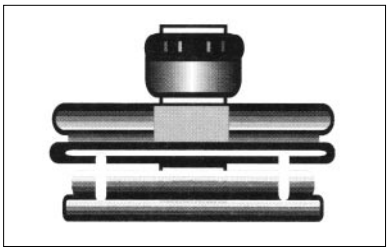


Figure 2b. Style b) Shur-Loc® Cap Assembly Compression Cap

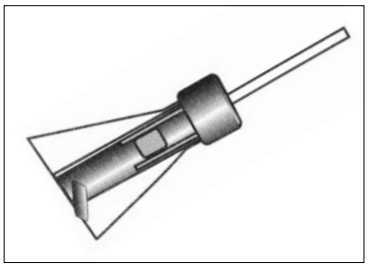


Figure 3a. Magnetically Driven Paddle with Glass, Polysulfone, or optional Stainless Steel Shaft

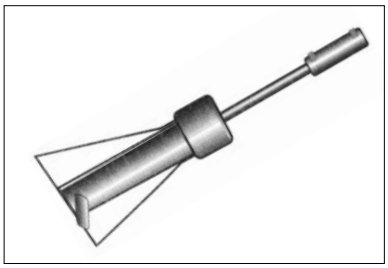


Figure 3b. Direct Drive Paddle Assembly

Cleaning and Siliconizing Your Vessel

Standard Glassware Cleaning Protocol

Although your vessel and parts were extensively cleaned prior to packing, we strongly recommend that you wash the vessel and components again to remove any residue that may have developed in the vessel after packing. It is easiest to do this prior to assembling the flask. There are several detergents on the market that are available for this purpose, including 7X® Original Cleaning Solution and Sigmaclean that can be purchased from your local lab supplier. Do not use detergents such as Alconox® or others that were developed for chemistry applications, since these cleaners leave a residue which can dissolve into cell culture media and make them alkaline. The use of a laboratory scrub brush is acceptable, but take care to check it for wear, to prevent scratching the glass. A plastic bristle brush is recommended. Thoroughly rinse the vessel and all components immediately with distilled or deionized water. Avoid letting the detergent dry on the surface of any parts. Allow parts to dry before assembling. When thoroughly dry, carefully assemble the vessel according to the case insert diagram.

Siliconizing Glassware

The basement membrane produced by many attachment-dependent cell lines grown on microcarrier beads may adhere to the glassware where it can complicate subsequent cell culture. In addition, proteinaceous material from cells or media may accumulate at the gas-liquid interface, creating a "crust" that can encourage further deposits. It is best to try and minimize its buildup on the wall of the vessel by placing a layer of silicone on the glassware. Several products on the market are available to accomplish this, such as SigmaCote® (Sigma Chemical Company), Prosil®-28 (PCR Research) or Repelcote® (Hopkins & Williams). It is best to follow the recommendations of the manufacturer as to their use. Be sure to thoroughly wash the vessel after treatment prior to its use in cell culture. One treatment is usually sufficient for many cell culture cycles. Another treatment is necessary when a noticeable buildup of cells or microcarriers on the surface of the glassware is noted.

The protocols described above are general procedures which work well with glassware that has had little use. In the event that the vessel has been used extensively and is markedly soiled, please refer to the section entitled "Disassembly, Care, and Maintenance" (page 20) prior to siliconizing the glassware.

Assembly of Vessels and Components

Paddle Assemblies – Magnetically Driven ProCulture® Spinner Flasks 4500, 4502, and 4504-Series Flasks

All paddles for vessels which are magnetically driven (4500-series, 4502-series and 4504-series flasks) are assembled in essentially the same manner as described below.

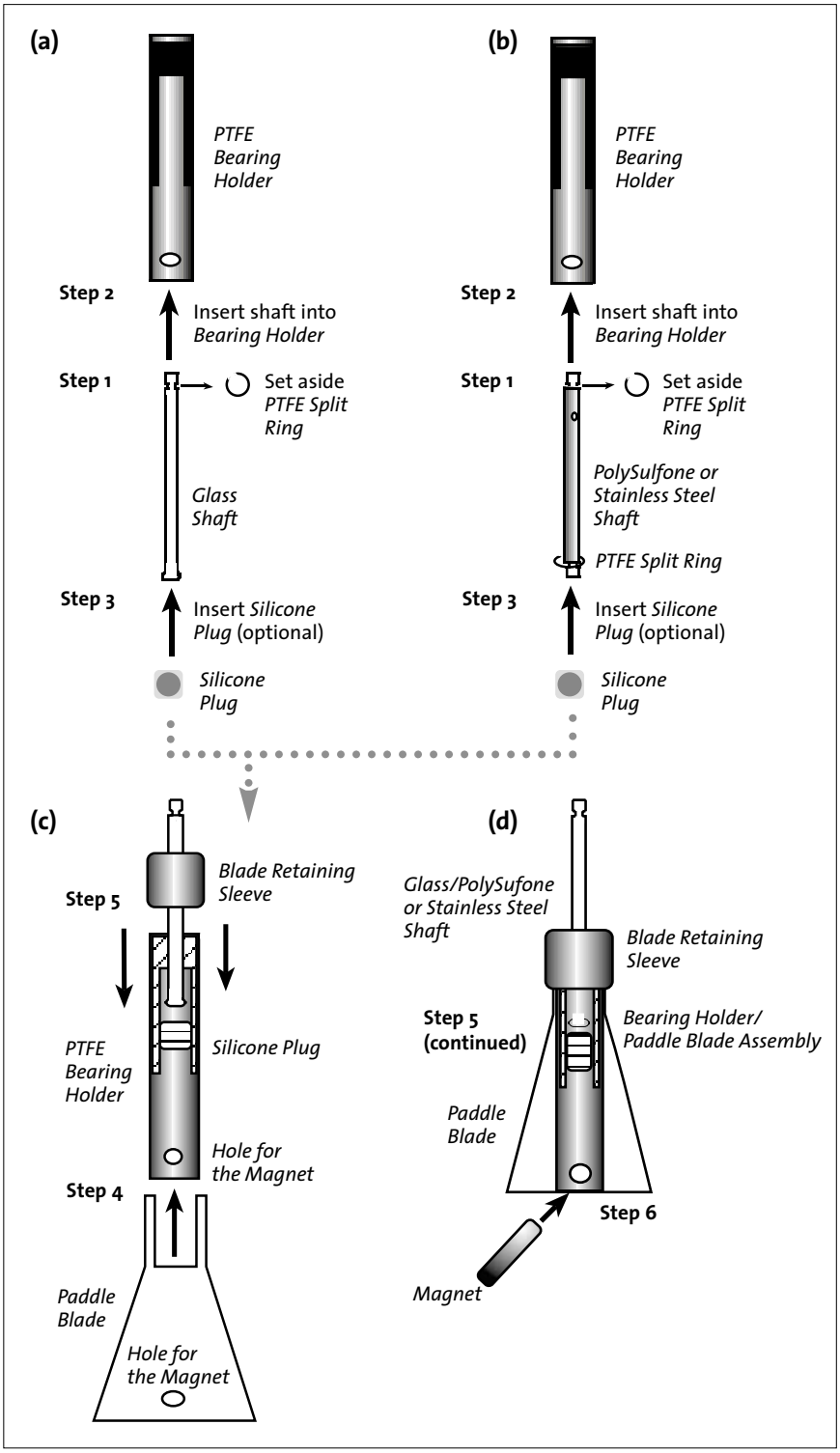


Figure 4. Magnetically Driven Paddle Assemblies

Flasks with Glass Shafts (Figure 4 a, c, d)

Step 1 (Figure 4a)

Remove the *PTFE Split Ring* from the end of the glass Shaft. (**Save this split ring for later use. It will be used in the final assembly of the cap**.)

Step 2 (Figure 4a)

Slide the end of the shaft (that is missing the PTFE split ring) into the hollow *Bearing Holder*.

Step 3 (Optional) (Figure 4a)

Insert the *Silicone Plug* into the *Bearing Holder*. This will safe guard against mircocarriers getting up into the Bearing Holder.

Proceed to Steps 4-6.

Flasks with PolySulfone Shafts or Optional Stainless Steel Shafts (Figure 4 b, c, d)

Step 1 (Figure 4b)

Remove one *PTFE Split Ring* from either end of the *PolySulfone or Stainless Steel Shaft*. These shafts have a hole drilled down through the center of the shaft and a small hole in the side of the shaft. The holes are interconnected and ensure that steam enters the *Integrated Compression Fitting* in the cap during autoclaving. (**Save this split ring for later use. It will be used in the final assembly of the cap**.)

Step 2 (Figure 4b)

Slide the end of the shaft that is now without the *PTFE Split Ring* into the hollow *Bearing Holder*.

Step 3 (Optional) (Figure 4b)

Insert the *Silicone Plug* into the *Bearing Holder*. This will safe guard against mircocarriers getting up into the *Bearing Holder*.

Proceed to Steps 4-6.

All Magnetically Driven Paddle Assemblies

Step 4 (Figure 4c)

Slide the *Paddle Blade* into the notch in the *Bearing Holder* (narrow end of the paddle blade first) until the *Hole for the Magnet* in the *Paddle Blade* lines up with the *Hole for the Magnet* in the *Bearing Holder*.

Step 5 (Figure 4c and d)

Take the *Blade Retaining Sleeve* with the notched end facing down and slide it down over the top of the *Glass/PolySulfone/or Stainless Steel Shaft* and onto the *Bearing Holder/Paddle Blade Assembly*. Position the narrow ends of the *Paddle Blade* into the notches of the *Blade Retaining Sleeve* and push down on it until the top portions of the *Paddle Blade* extend completely into the notch of the *Blade Retaining Sleeve*.

Step 6 (Figure 4d)

Insert the *Magnet* into the aligned holes until it is centered in the combined assembly. The *Paddle Blade* should not be able to slide on the *Bearing Holder*. It should now be held in place by the *Magnet*.

Note: If the narrow portion of the *Paddle Blade* should disengage from the *Blade Retaining Sleeve* during subsequent handling of the paddle assembly, simply place it back into the notch by gently twisting to insert it into the notches on the retaining sleeve.

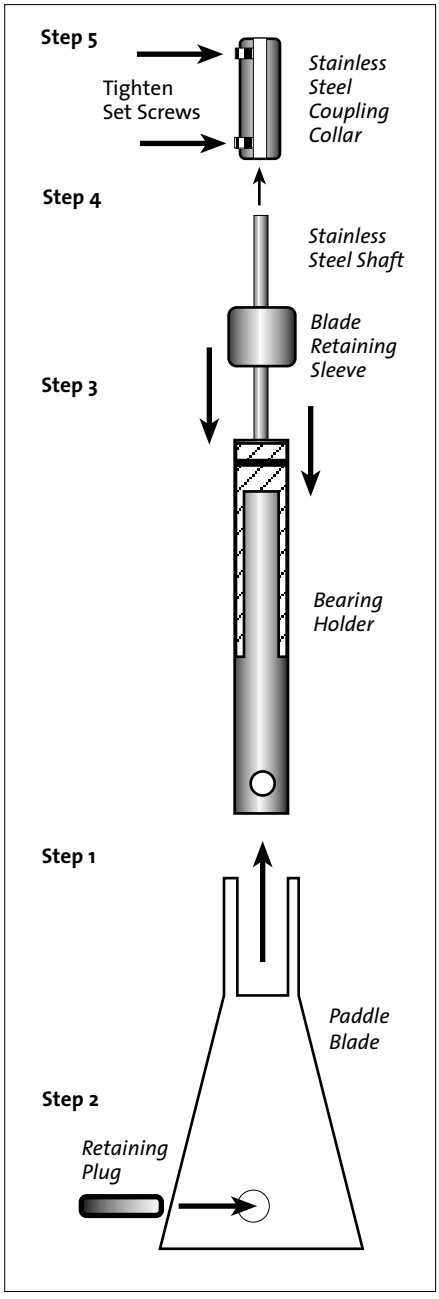


Figure 5. Direct Drive Paddle Assembly

Paddle Assemblies – Direct Drive ProCulture® Spinner Flasks 4510, 4512-Series Flasks

Direct drive paddles (4515) are assembled as shown in (Fig. 5).

Step 1

Slide the *Paddle Blade* into the notch in the *Bearing Holder* (narrow end of the paddle blade first) until the hole on the blade lines up with the hole in the bearing holder.

Step 2

Insert the short, rounded *Retaining Plug* into the aligned holes until it is centered in the combined assembly. The *Paddle Blade* should not be able to slide on the bearing holder.

Step 3

Take the *Blade Retaining Sleeve* with the notched end facing down and slide it down on top of the newly assembled *Bearing Holder* and *Paddle Blade*. Position the narrow ends of the paddle blade into the notches of the *Blade Retaining Sleeve* and push down until the top portions of the blade extend completely into the notch in the retaining sleeve.

Step 4

Slide down one end of the *Stainless Steel Coupling Collar* onto the *Stainless Steel Shaft*. The other part of the coupling collar will slide up onto the flat portion of the drive unit shaft in a later assembly. For more detail, see Figures 6 through 9.

Step 5

Tighten the set screws on both sides of the collar so that the collar does not turn on the shaft.

Figure 6. Coupling collar – larger opening for paddle shaft

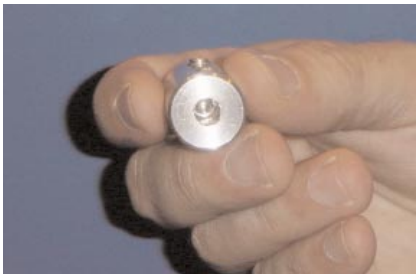


Figure 7. Coupling collar – smaller opening for drive shaft

Figure 8. Slide larger opening on coupling collar over paddle shaft (Step 4).

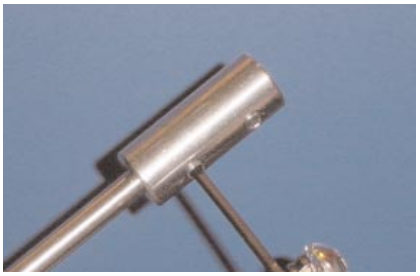


Figure 9. Tighten lower set screw (Step 5).

Cap Assemblies – Magnetically-Driven ProCulture® Spinner Flasks

Screw Caps for 4500 and 4502-Series Flasks (Figure 10 a-c)

The 70 mm, 100 mm, and 120 mm screw cap assemblies are comprised of 3 components:

- *Screw Cap with Integrated Compression Fitting* (ICF) **(Figure 10c)**
- *Silicone Liner* **(Figure 10c)**
- *Shaft Retaining Nut* **(Figure 10a)**

Note: Glass, polysulfone and stainless steel shafts for 4500, 4502 and 4504 impeller assemblies come in 2 sizes, 6 mm (1/4") for 125 mL - 1000 mL flasks and 8 mm (5/16") for all flasks 3000 mL and larger. The size of the *Shaft Retaining Nut* must be identical to the size of the corresponding *Impeller Shaft* **(Figure 10a)**. A 6 mm (1/4") *Impeller Shaft* will only work with a 6 mm (1/4") *Shaft Retaining Nut*. For example, it will not be possible to insert a large 8 mm (5/16") shaft into a smaller 6 mm (1/4") hole in the nut. In the other instance, if a smaller 6 mm (1/4") shaft is inserted into a large 8 mm (5/16") retaining nut, there is excessive side-to-side wobble of the shaft and poor agitation. Therefore, be sure to match the correct fitting and shaft to eliminate any problems.

Step 1 (Figure 10c)

Secure the *Silicone Liner* into the top of the *Screw Cap with Integrated Compression Fitting*. In order to help secure the *Silicone Liner*, the integrated compression fitting and outer edge of the screw cap have been undercut to create a "notch" into which the liner fits.

Step 2 (Figure 10a)

Remove the *Shaft Retaining Nut* from the cap. Slide the knurled, larger end of the *Shaft Retaining Nut* onto the glass, polysulfone or stainless steel *Impeller Shaft* on the *Assembled Paddle*.

Step 3 (Figure 10b)

Insert the *PTFE Split Ring* back onto the notch of the shaft from which it was previously removed during the Paddle Assembly process, page 8.

Step 4 (Figure 10c)

Insert the *Completed Paddle Assembly and Retaining Shaft* into the *Screw Cap with Integrated Compression Fitting* and tighten the assembly by turning the *Shaft Retaining Nut* clockwise until the nut is tightened down on the compression fitting. The paddle shaft should not be able to be withdrawn from the compression fitting. The paddle assembly should spin freely on the shaft if pushed in a circular motion in any direction.

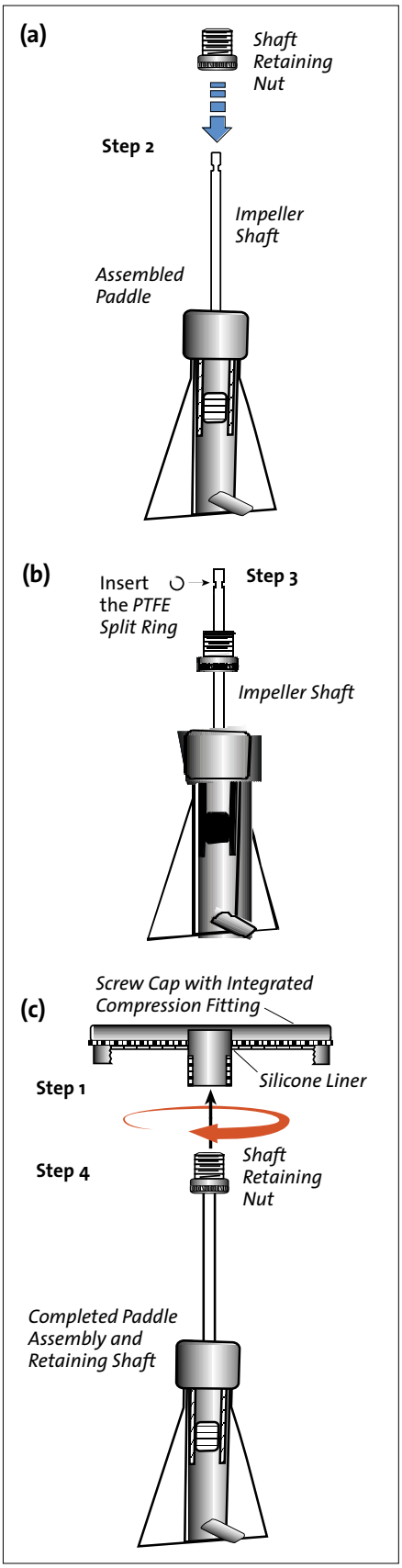


Figure 10. Magnetically Driven Screw Cap Assembly

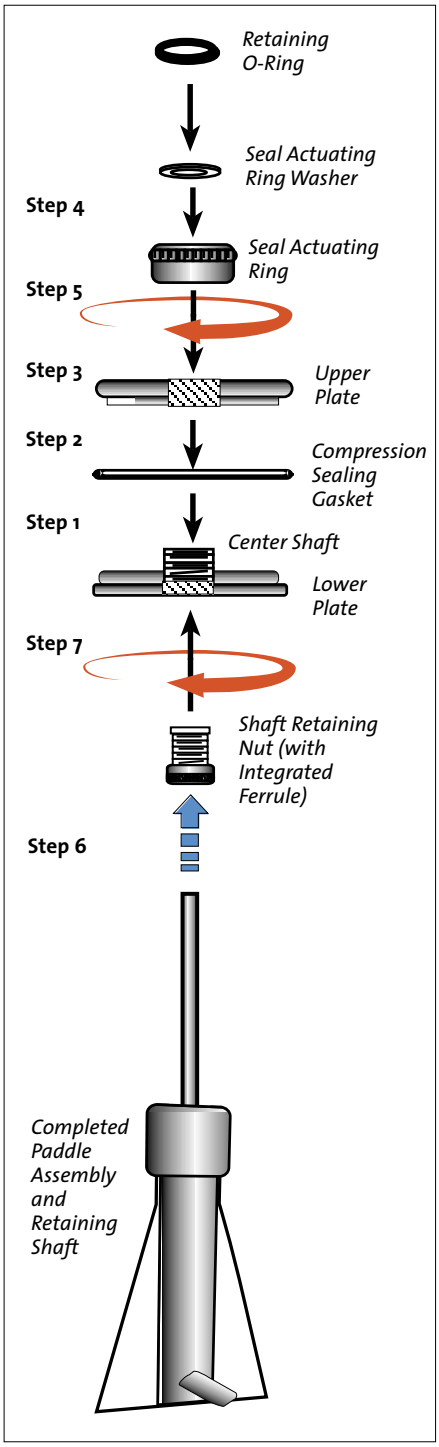


Figure 11. Magnetically Driven Shur-Loc Cap Assembly

Cap Assemblies – Magnetically-Driven ProCulture® Spinner Flasks

(Continued)

Shur-Loc™ Style Caps for 4504-Series Flasks and for Production Style 4500 and 4502-Series Flasks (Figure 11)

The Shur-Loc style cap is composed of:

- *Lower Plate*
- *Upper Plate*
- *Compression Sealing Gasket*
- *Seal Actuating Ring*
- *Seal Actuating Ring Washer*
- *Retaining O-Ring*
- *Shaft Retaining Nut*

Step 1

Slide the large *Compression Sealing Gaske*t onto the *Lower Plate* until it fits over the notched area.

Step 2

Insert the threaded *Center Shaft* of the *Lower Plate* into the hole in the *Upper Plate*.

Step 3

Hold the two halves together, and screw the *Seal Actuating Ring* loosely onto the extending threaded *Center Shaft*.

Step 4

Drop the *Seal Actuating Ring Washer* onto the shaft, and then push the *Retaining O-ring* onto the shaft until the O-ring fits into the notch on the shaft.

Step 5

Turn the *Seal Actuating Ring* clockwise until you feel the large *Compression Sealing Gaske*t begin to extend out from the cap assembly.

Step 6

Slide the *Shaft Retaining Nut* with the knurled, larger end first onto the glass, polysulfone or stainless steel shaft of the *Completed Paddle Assembly and Retaining Shaft* and replace the *PTFE Split Ring* back onto the notch on the shaft from which it was previously removed during the Paddle Assembly process, page 8.

Step 7

Insert the *Completed Paddle Assembly and Retaining Shaft* into the newly completed Shurloc Cap Assembly and tighten the assembly by turning the *Shaft Retaining Nut* clockwise until the nut is tightened down on the compression fitting. The paddle shaft should not be able to be withdrawn from the compression fitting. The paddle assembly should spin freely on the shaft if pushed in a circular motion in any direction.

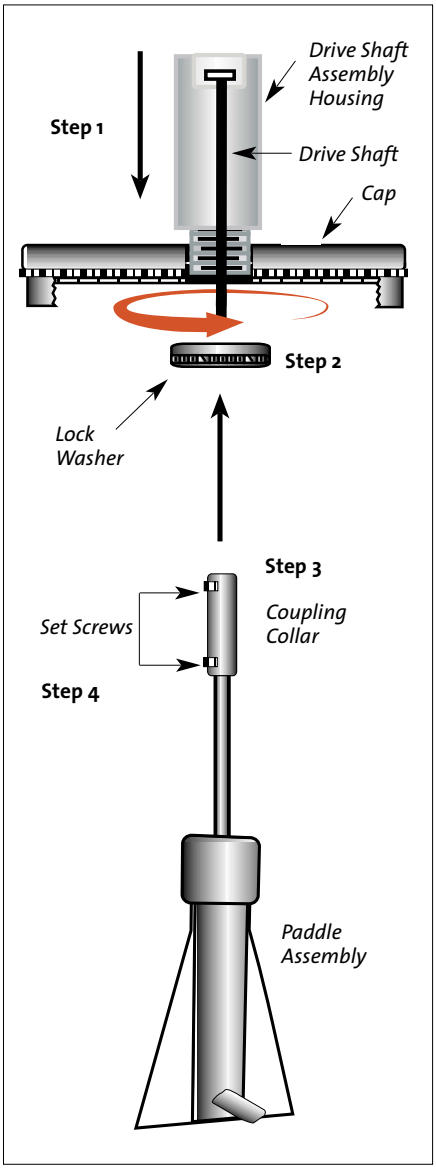


Figure 12. Direct Drive Cap Assembly

Cap Assemblies – Direct Drive ProCulture® Spinner Flasks, 4510 and 4512-Series Flasks

Connection of Direct Drive Systems with 100 mm or 120 mm Cap Assembly (Fig. 12)

Step 1

Insert the ProCulture 4520-104, 4520-106-Series *Drive Shaft Assembly Housing* into the center of the appropriate cap. The "flats" on the threaded portion of the bottom of the drive help to orient the drive shaft in the cap. The drive shaft should protrude out of the bottom of the cap assembly.

Step 2

Tighten the *Lock Washer* onto the threads of the Direct Drive Housing under the cap.

Step 3

Slide the assembled *Coupling Collar/Paddle Assembly* up onto the protruding drive shaft.

Step 4

Tighten the *Set Screws* on both sides of the *Coupling Collar* so that the collar does not turn on the drive shaft.

Alternatively, slide the smaller opening on the coupling collar over the drive shaft in the cap assembly (Fig. 13), and tighten the upper set screw (Fig. 14). Insert the stainless steelpaddle shaft into the larger opening in the bottom of the coupling collar (Fig. 15) and then tighten the lowerset screw on the coupling collar (Fig. 16).

Figure 13. Insert drive shaft in cap assembly into the smaller opening of the coupling collar

Figure 14. Tighten the upper set screw

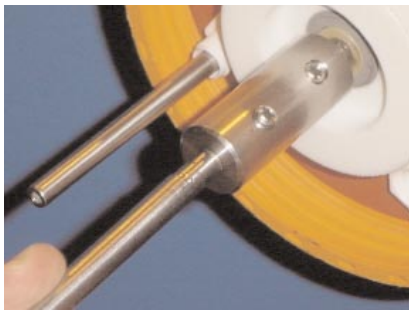


Figure 15. Insert paddle shaft into coupling collar

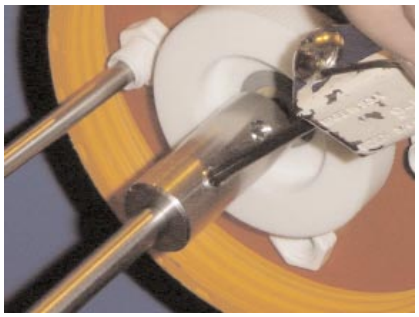


Figure 16. Tighten lower set screw on the coupling collar

Cap Assemblies – Direct Drive ProCulture® Spinner Flasks, 4510 and 4512-Series Flasks *(Continued)*

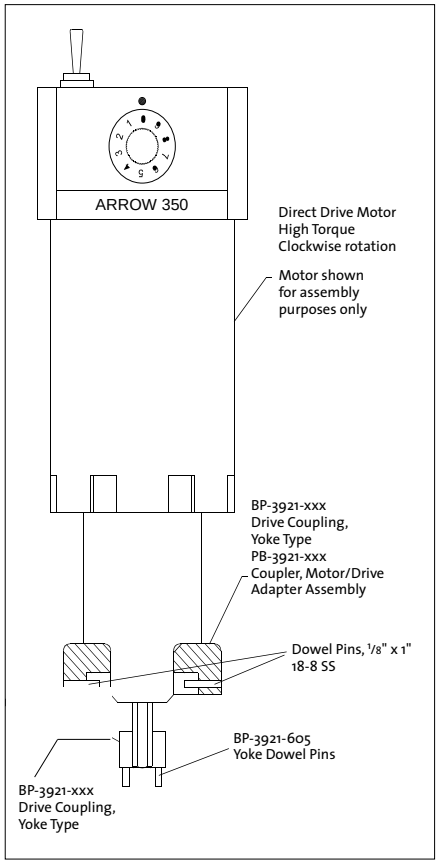


Figure 17. Schematic of Direct Drive Motor

Inserting Assembled Paddle into Flask and Coupling of Motor to Direct Drive Shaft (Fig. 17)

Step 1 (Figures 18, 19, 20)

Bend the paddle blades slightly and insert the assembled paddle into the center neck of the flask (Fig. 18). After insertion, straighten the paddle blades with your fingers. Also, re-insert the tabs on the top of the paddle blade into the notches on the paddle blade retaining sleeve (Fig. 19). Then, screw down the cap on the threads of the flask center neck (Fig. 20).

Step 2 (Figures 21 and 22)

Note the location of the two engagement slots for the bayonet fittings (see Fig. 17, *Dowel Pins*, 1/8" × 1") on the top of the drive shaft (Fig. 21). The dowel pins on the bottom of the *Direct Drive Motor* (Fig. 22) will slide into these slots to secure the motor in place for operation.

Step 3 (Figure 23)

Tilt the motor slightly from vertical and slide the yoke coupling into the cavity on the top of the direct drive shaft (Fig. 23). The yoke dowel pins will engage with the drive pin inside of the cavity when the motor is correctly oriented.

Figure 18. Insert the assembled paddle into flask (bend paddle if necessary)

Figure 19. Straighten paddle blades after insertion

Figure 20. Place cap on flask and tighten

Cap Assemblies – Direct Drive ProCulture® Spinner Flasks, 4510 and 4512-Series Flasks *(Continued)*

Step 4 (Figure 24)

Turn the motor until the dowel pins on the motor drive adapter assembly line up with the vertical section of the bayonet fitting. You can use the end of the dowel pins that are exposed on the motor drive adapter to help you orient the inside portion of the dowel pins with the bayonet fitting as shown in Fig. 24. You will know that the dowel pins are corrently oriented when the motor unit drops slightly into the vertical slots.

Step 5 (Figure 25)

When the dowel pins have dropped into the slots, turn the motor slightly clockwise to lock the entire assembly together as shown in Fig. 25.

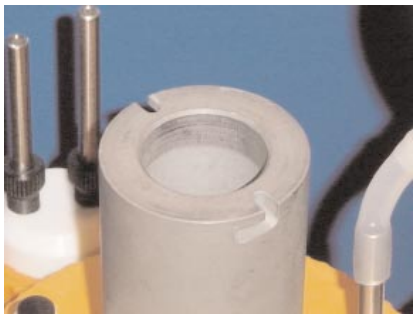


Figure 21. Engagemnet slots for bayonet fittings

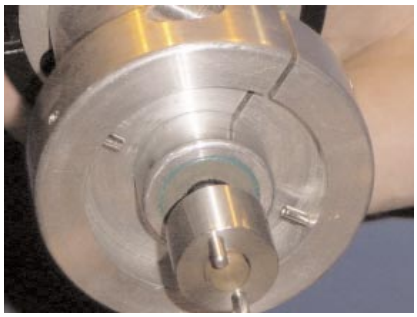


Figure 22. Closeup of bayonet fittings and yoke dowel pins

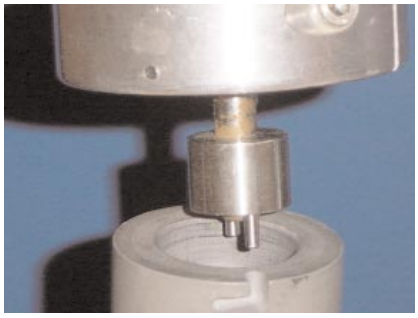


Figure 23. Coupling of motor and Direct Drive Shaft

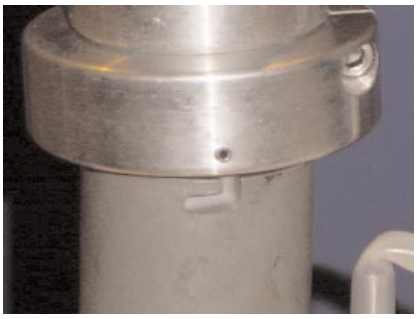


Figure 24. Correct orientation of motor on Drive Shaft

Figure 25. Assembly is locked in place

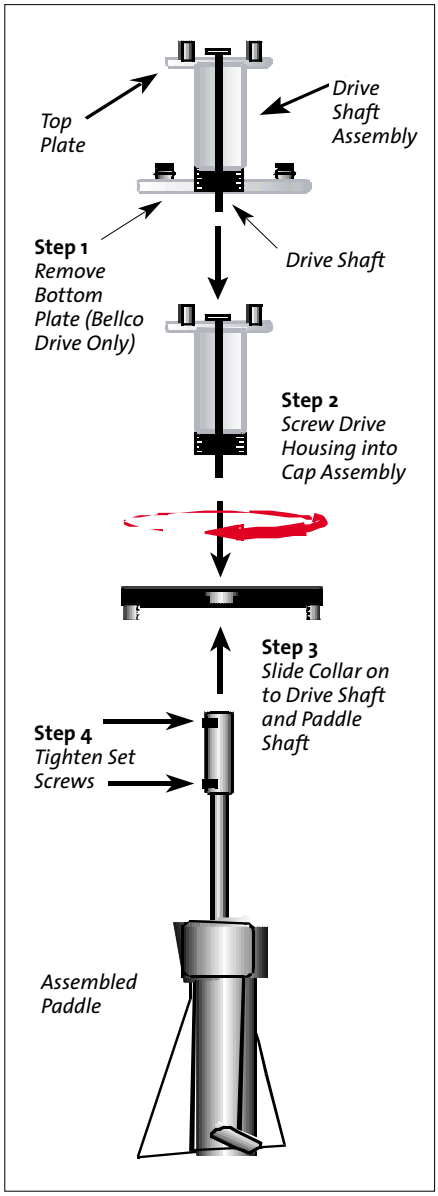


Figure 26. ProCulture® 100 mm/120 mm Cap with a Bellco Direct Drive System

Cap Assemblies – Direct Drive ProCulture® Spinner Flasks, 4510 and 4512-Series Flasks *(Continued)*

Connection of Bellco™ Technology Direct Drive Systems with a ProCulture® 100 mm or 120 mm Cap Assembly (Fig. 26)

Step 1

If using a Bellco OverHead Drive, remove the bottom plate from the Bellco OverHead Drive Cap Assembly. To do so, grasp the housing firmly and turn the bottom plate counter-clockwise until it turns.

Step 2

Take the housing and top plate portion of the Bellco drive assembly and gently screw into the threaded opening of the 100 or 120mm cap. Support the silicone liner on the underside of the cap to keep it from being displaced. This will require a number of turns, but ultimately the shaft housing will "bottom-out" in the cap assembly and stop turning. The drive shaft should protrude out of the bottom of the cap assembly;

Step 3

Slide the assembled coupling collar/paddle assembly up onto the protruding drive shaft of housing.

Step 4

Tighten the set screws on both sides of the collar so that the collar does not turn on the drive shaft. (Consult your Bellco Instruction Manual for the OverHead Drive if you have any additional questions regarding the Bellco Drive.)

Final Assembly of Vessels and Autoclaving

Vessel Assembly

1. Insert the combined paddle and cap assembly into the vessel. It may be necessary on the larger vessels to bend the paddle blades slightly while the paddle assembly is being slid into the center neck of the vessel
2. If the blades should pop free from the blade retaining ring, lift the assembly up in the vessel and gently reinsert the blades back into the notches in the blade retaining ring.
3. Secure the screw cap onto the vessel by tightening it slightly on the threads of the center neck.

   Important: For the Shur-Loc® Cap Assemblies (70 mm, 100 mm, 120 mm Production Style 4500-series and 4502-series Vessels, and 140 mm cap assemblies on 4504-series and 4514-series with 140mm center neck openings), DO NOT expand the O-ring on the cap. Simply insert the assembled cap and paddle assembly into the flask, allowing it to loosely rest on the neck of the flask.

   The gasket will expand during autoclaving and seal the vessel automatically.

   Important: Do not tighten any of the cap assemblies (Center neck or Sidearm) on the vessel. Over-tightening or securing the cap too tightly in or on the vessel can result in implosion of the vessel during autoclaving and/or fracturing of the center neck opening during autoclaving.
4. Loosely place the caps onto the sidearm ports. A slight clockwise turn of the cap onto the glass is sufficient to keep the caps from falling off the vessel while transporting it to the autoclave.
5. The vessel is now ready for autoclaving.

   Note: Use of Vented Membrane Cap (Corning Cat. No. 1395-45LTMC) is recommended, as it will allow gas to exchange more readily through the sidearms.

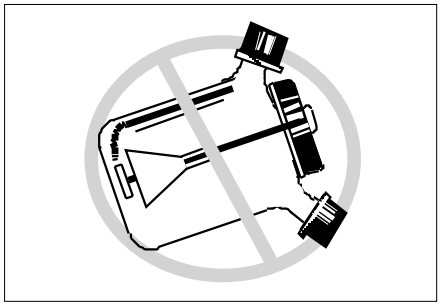


Figure 27. Place spinner flask in an upright position when autoclaving the vessel. Do not lay on its side.

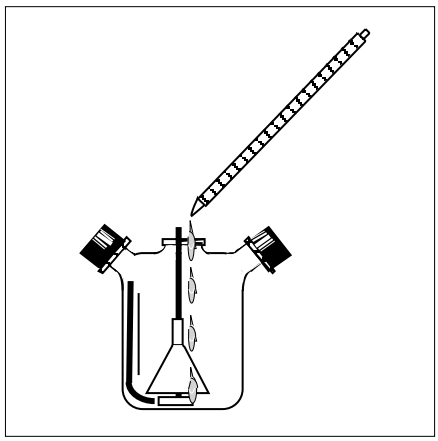


Figure 28. A small amount of water (5 - 10 mL of distilled or deionized water per 10 L of vessel volume) can be added into the larger vessel to generate additional steam in the vessel during autoclaving.

Autoclaving

1. After assembly, place the vessel into an autoclave. We recommend that the vessels are autoclaved in an upright position. (Fig. 27).

   Note: A small amount of deionized water may be added to the vessel to generate additional steam during autoclaving (Fig. 28).
2. Check once more that the sidearm caps are still loosely attached, and that the cap on the center neck has not shifted during transport to the autoclave to allow for adequate transfer of steam into the vessel and venting during and after autoclaving.
3. If the vessel is too large to autoclave in an upright position, the cap and paddle assembly must be removed, autoclaved separately in an autoclave bag, and then aseptically reassembled in sterile conditions under a hood. Failure to do so may result in the bearing holder warping which will result in poor agitation of the paddle assembly.
4. Autoclave the vessel using a "liquid" cycle for a minimum of 30 minutes at 121° C and 15 psi. For larger vessels extended autoclaving may be necessary. All parts of the vessel have been designed to be autoclaved repeatedly using the conditions described above.
5. Allow the vessel to cool after autoclaving. On vessels with the Shur-Loc® center neck opening (Corning® flasks 4504-series and 4514-series with 140 mm center neck openings, or Production Style 4500-series and 4502-series), it is advisable to turn the seal actuating ring on the cap slightly clockwise to expand the O-ring slightly as the vessel cools, since the cap assembly contracts slightly while it cools. This will guarantee that the vessel remains sealed and sterile.

Basic Operation

Important Note:
We strongly recommend that a sterility check be accomplished by incubating the vessel containing the medium for 24 hours prior to inoculation of the vessel. This will insure that the sterilization and medium transfer were accomplished aseptically.

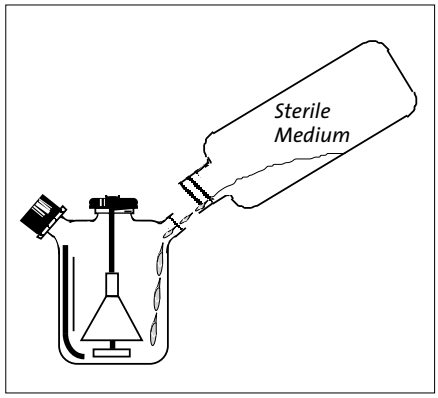


Figure 29. Small vessel being filled through a sidearm

Filling the Vessel with Medium

This section provides basic information for cell culture methods using ProCulture® Spinner Flasks. Novices should consult a detailed guide to cell culture methods, such as *Culture of Animal Cells, A Manual of Basic Technique* by R. Ian Freshney, Alan R. Liss Publishing, New York, 1994, or *Cell and Tissue Culture, Laboratory Procedures* by Doyle, A, et al., John Wiley & Sons, Sussex, England, 1995 for specific details. There are also several fine video tapes which describe the methods in detail. The websites of media companies are also an excellent resource. They contain the most current media under development for cell suspension cultures.

Filling

Filling the vessel can be accomplished in a variety of ways, and is best done in a sterile biological hood or a clean room.

Small vessels (Center Neck or Sidearm Introduction):

1. Open the vessel after it cools by loosening the center cap assembly and gently shifting the cap and paddle slightly over, allowing it to rest on the lip of the center neck opening, or remove sidearm cap and rest in hood.
2. Introduce medium by pouring from pre-sterilized bottles or bags containing medium by gravity-feed or peristaltic pumps as shown in Fig. 29.
3. "In-line" addition is an alternative. Unsterilized medium can be added by filtering "in-line," using a length of sterilized tubing connected to a 0.2 micron filter attached between the unsterilized medium source and the vessel. Either gravity-feed or a peristaltic pump can be used to move the fluid. By using a filling bell supported by a ring stand as shown in Fig. 30, several vessels can be rapidly filled.

Large vessels (Sidearm Introduction):

1. Medium addition is usually done using the "in-line" sterilization method described above.
2. With larger flasks, medium addition is usually done via the sidearms rather than the center neck. Again, the use of a filling bell supported by a ring stand as shown in Fig. 30 greatly simplifies this operation.

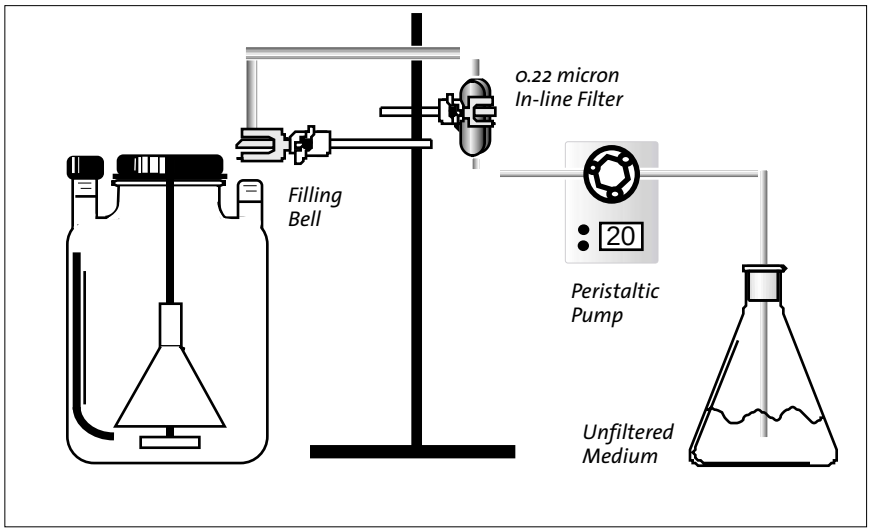


Figure 30. Large vessel being filled with the use of a filling bell and ring stand

Inoculating and Agitating the Vessel

Inoculating

Inoculating the vessel can be accomplished in a variety of ways, and is best done in a sterile biological hood or a clean room.

After the vessel passes the sterility check cells can then be harvested and safely added to the vessel. Cells can be introduced by reconstituting cell pellets in a smaller volume of medium after harvesting. Adding cells is usually done using a syringe or length of sterile tubing into the center neck opening or sidearms. Inoculation densities are usually determined empirically using smaller test vessels such as T-flasks or small spinner flasks.

For cells which are anchorage-dependent, sterile microcarrier beads can be added to the vessel prior to or during the inoculation of the vessel. Cells and beads are often agitated intermittently during the attachment phase of the cells to the beads. A good reference text, such as *Culture of Animal Cells, A Manual of Basic Technique* by R. Ian Freshney, Alan R. Liss Publishing, New York, 1994, or *Cell and Tissue Culture, Laboratory Procedures* by Doyle, A, et al., John Wiley & Sons, Sussex, England, 1995, or our Technical Service Department (800.492.1110, or outside the U.S. 001.978.635.2200) can help you with these procedures.

Agitating

The ProCulture® Spinner Flasks have been engineered to achieve excellent mixing of vessel contents using slow speeds. The combination of the paddle design and vessel baffles provide optimal uplift. The surface-breaking design of the paddle also ensures adequate aeration of the cell culture medium at slower speeds. High speed stirring can be detrimental and is best done by slowly adapting cells to the higher shear forces which often develop at the higher speeds.

Initial stirring speeds for flasks of various flask sizes are listed below. These speeds should be regarded as suggestions only, and final agitation rpms need to be determined empirically.

Flask Size	rpm
100 mL to 1,000 mL	50 - 60
3,000 mL to 8,000 mL	40 - 50
15,000 mL to 36,000 mL	30 - 40

Note: It is important in scaling up that rpm in one flask should always be equated to tip speed in the larger flask. Since the dimensions of the paddle may change from one flask to another, using rpm alone will often result in detrimental cell viability. This is because a larger paddle will "travel" much further at a given rpm than a smaller one. There are a number of magnetic stirrer platforms or direct drive units that are available in the marketplace which will allow controlled agitation at these speeds.

Disassembly, Care and Maintenance

Disassembly

To disassemble the vessel for cleaning, remove the cap/paddle assembly from the vessel. Loosen the shaft retaining nut holding the paddle in the cap assembly, remove the split rings, and pull out the paddle shaft. Take precautions when removing a glass shaft from the cap assembly in the event that it has "seized" inside the cap compression fitting. If the shaft does seize, place the cap/paddle assembly into an autoclave and heat for a few minutes to soften the plastic components. This will usually allow the shaft to be removed without breaking. As a precaution, wrap the shaft in a towel as it is removed to prevent cuts in case it does snap.

After removal, follow the assembly directions in reverse to finish disassembling the paddle and cap.

Note: We recommend placing the parts into a dilute cleaning solution to soak as soon as possible after disassembly. If the flask needs to be decontaminated, pour out the contents into a separate vessel (kill tank), and fill the flask (including the internal components) as soon as possible with a bleach solution. After treatment, rinse thoroughly and wash or soak in the cleaning solution as above.

Care and Maintenance

The ProCulture® vessels have been constructed of materials that should allow multiple autoclavings for extended periods of time if the flask is properly cared for. Extended autoclaving times at elevated temperatures, or soaking the vessel or parts in acids, bases or strong oxidizing agents for unusually long lengths of time will result in these materials deteriorating more quickly than usual.

Basic Care

Care should be taken when washing the vessels to minimize bumping against other glassware or the sides of sinks so that stress fractures do not develop in the glass and result in failure during autoclaving. Check the wire brushes used to clean the vessels and discard them when the bristles are worn to avoid scratching the glassware.

Over time, buildup of biological or mineral residues on the walls of the glass vessels or parts may occur. If this happens, consult the section below entitled “Rigorous Glassware Cleaning Protocols for Severely Soiled Flasks.”

The synthetic rubber, Delrin and Noryl components will slowly “age” from repeated autoclaving and become brittle. These parts should be replaced when the decrease in their flexibility or stress fractures becomes apparent. Plastics, especially PTFE, have a tendency to warp during autoclaving. This is normal but may cause problems after extended periods in the ability of the paddle to spin freely on the glass or stainless steel shafts. If this happens a replacement PTFE bearing holder can be purchased to replace the warped one. Avoid the use of organic solvents on any of the plastic or synthetic rubber parts since it may weaken them and significantly reduce their life span.

Rigorous Glassware Cleaning Protocols for Severely Soiled Flasks

After extended use, residues may build up on the flasks and components requiring more rigorous cleaning of the flasks. These residues may include pyrogenic materials, buildup of dead cells and debris on the vessel, and components of the cell culture medium. To minimize the buildup of these materials, we recommend that the parts are soaked in a dilute cleaning

solution as soon as cell culture is terminated. Disassemble the vessels to facilitate penetration of the cleaning agent. Several protocols are described below. After these treatments have been performed, be sure to wash all components again as was described early in this manual in the "Standard Glassware Cleaning Protocol" in the section "Cleaning and Siliconizing Your Vessel," on page 7. Glassware cleaning is reasonably straightforward. Silicone and synthetic rubber components tend to absorb cleaners and other chemicals and so more caution must be taken to minimize contact with them.

Depyrogenation

1. Baking

Glassware can be baked for at least 12 hours at 250° F (120° C), then clean as described in the, "Standard Glassware Cleaning Protocol" on page 7. DO NOT USE HEAT TREATMENT ON ANY OF THE PLASTIC OR SILICONE/SYNTHETIC RUBBER COMPONENTS.

2. Chemical Treatment

Soak flask components in solutions of sodium hydroxide (0.1 N to 1.0 N NaOH) for at least 1 hour, followed by soaking and then repeated washing with distilled or deionized water. To ensure that all traces of NaOH are gone, check the pH of the soaking solutions to ensure that they are not alkaline. Some investigators chase the NaOH treatment with a weak solution (0.1 N to 1.0 N) of phosphoric acid to neutralize the NaOH prior to rinsing in distilled water.

Removal of Biological and Organic Residues

1. Ashing

Glassware can be treated by baking at a temperature of at least 450°C (840°F) for at least 3 hours. This removes all organic compounds to a mineral and carbon ash. DO NOT USE THIS TREATMENT ON ANY OF THE PLASTIC OR SILICONE/SYNTHETIC RUBBER COMPONENTS.

2. Chemical treatment with NaOH

Follow the procedure described above under Depyrogenation.

3. Chemical treatment with Chromic Acid

This treatment is very effective in decomposing biological molecules, and also is helpful to reduce mineral deposits. Be sure to follow all normal safety precautions when handling acid solutions. Chromic acid is made by dissolving 20 g of Na^- or K^- chromate in sufficient water to make a paste. Add 300 mL of concentrated H_2SO_4. Glassware can be treated for as long as 24 hours. Rinse and clean afterwards as described in the "Standard Glassware Cleaning Protocol" on page 7.

Removal of Mineral Deposits

Residual scale which is built up on glassware may be removed to varying extents by treatments with acids, such as sulfuric, nitric, hydrochloric acid or chromic acids as described above. The nitric acid treatment is especially useful in removing buildup of material causing corrosion of stainless steel parts. Follow safety procedures in handling as with chromic acid above. Start with short, mild treatments and gradually increase the strength of the reagent and length of exposure as necessary.

Additional Information

Application Check List

1. Select the Unit Operation(s) necessary from the Schematic Circuit illustrations on pages 28 and 29 and the list below:
   - Continuous Sparging
   - Controlled Sparging
   - pH Monitoring/Control
   - Temperature Monitoring/Control
   - O_2 Monitoring/Control
   - Media/Inoculum Handling
   - In-line Microporous or Ultrafiltration
   - Vessel Venting
2. Find the desired Unit Operation Schematic Circuit Diagram from the illustrations which most closely matches your needs and jot down the fittings for that operation. Specific listings of components are summarized in the brochure.
3. Determine the number of sidearms on the vessel necessary to accomplish the Unit Operations desired. Typically, each fitting requires one free sidearm port. Keep in mind that if the number of sidearm fittings needed exceeds the number of sidearms on the vessel selected, it is often possible to rearrange the fittings on a sidearm port to provide more than one Unit Operation on that sidearm.
4. Select the type of probe and penetration-style, if any. There are two basic styles:
   - Threaded probe with/ without mounting fitting
   - Insertion probe

   Note: Contact manufacturer for information on the type and size of the mounting fixture. Obtain prints if possible. Most Ingold/Mettler-Toledo or Broadley-James products can be supported by Corning.
5. Contact Corning Technical Support Department (1.800.492.1110 in the U.S. Outside the U.S., please call your local Corning Representative) to determine the availability of side port fittings to match the type of probe and fitting.
6. If a probe is not an insertion-style, there is a nominal fee for specially modifying side ports to match your needs. Contact your local Corning Representative.

7. Select liquid handling and gassing requirements, if any.
   - Liquid handling and gassing tubes can be obtained in 1/8", 1/4" or 1/2" OD sizes.
   - These sizes are roughly matched to fit the 8L, 15L, and 36L vessels, respectively, but should be used only as a guide. For some applications an inlet tube of greater or lesser diameter may be more appropriate. In these cases it is often possible to "mix-and-match" tubing of differing diameters on the same fitting. The 4519-120/122 fittings are an example of such a situation.
   - In most cases, 1/2" OD tubing will be necessary for any microporous filtration applications to provide sufficient recirculation flow to generate the flux rates necessary for effective tangential flow filtration.
   - Flask venting can be accomplished with two types of fittings:
   - 1395-45LTMC – Features an integral 25 mm 0.2 micron, PTFE filter built into the cap. This is generally suitable for operation with 1/8" inlet gassing fitting.
   - 4519-106 – Features a threaded design which will accept most replaceable 50 mm 0.2 micron, PTFE filters with 1/8" NPT threads. This is generally suitable for operation with 1/4" inlet gassing fitting.

Frequently Asked Questions and Troubleshooting Guide

Use the following guide to help you with the occasional problem you may experience with your ProCulture® Spinner Flasks. These commonly asked questions will guide you prior to calling our Technical Support Department (1.800.492.1110 in the U.S. Outside the U.S., please call your local Corning Representative)

- **The medium in my flask is turning alkaline prior to addition of cells.**

  The flask may have been improperly washed using a detergent not designed for cell culture. Rewash the flask and components using a detergent designed for cell culture and rinse thoroughly with distilled water (See Cleaning and Siliconizing Your Vessel, page 7).

- **The impeller in my magnetically-driven flask is not turning smoothly.**

  The flask may not be centered above the magnet inside the magnetic stirrer. Try moving the flask slightly on the magnetic stirrer until smooth motion is observed.

- **The impeller in my magnetically-driven flask turns smoothly at slow speeds, but begins to turn in a disruptive or intermittent manner as the speed of the magnetic stirrer is increased.**

  The speed of the magnetic stirrer is set too high or has been increased too quickly. As a result, magnetic decoupling is occurring. Or the viscosity of the medium is too high, also resulting in decoupling.

- **What volume should I place in the flask?**

  For New Users:

  It is good to start at 50% of the working volume of the flask. In subsequent runs, add 10% more volume each time until cell density plateaus or maximum working volume of flasks is achieved.

  For Users of Conventional Flasks:

  One should start at the same volume as your current flask. In subsequent runs, add 10% more volume each time until cell density plateaus or maximum working volume of flasks is achieved.

  Note: If the cell density plateaus before the maximum working volume is achieved, you may need to use an augmented operation to boost productivity.

- **What is the correct speed to spin a flask and how do I adjust the speed as my flask size changes?**

  First, look at the recommended guidelines for each flask size on page 19.

  For New Users:

  In small flasks, keep tip speed between 3-5 in/sec. In large flasks, keep tip speed between 10-15 in/sec. In subsequent runs, try and increase flask tip speed until cell density plateaus, or cell viability drops.

  For Users of Conventional Flasks:

  One should start at the same volume as your current flask. In subsequent runs, try and increase the flask tip speed until cell density plateaus, or cell viability drops.

- **Why Direct Drives and what size?**

  The decision to choose a direct drive is mainly a function of the fact that magnetic decoupling occurs at greater than 8L sizes, especially at the 15L and 36L sizes. Magnets in stirrer plates are too small, and thus do not have enough power to stir large paddles and the increased volumes of liquid that are in the larger flasks. The direct drives couple the drive shaft and motor together to aid in better stirring.

- **Which manufacturer's probes can I use, and which kind?**

  For autoclavable insertion-style oxygen, pH or temperature sensor probes, Broadley-James and Ingold are the two major manufacturers of these probes. For sizes ranging from 500 mL to 8L flasks, most investigators use 12 mm diameter probes with a length long enough to get the tip of the probe to approximately 50% of the working volume of the flask. When using the 15L and 36L size flasks, older 25 mm diameter probes can also be used.

- **Why choose vertical sidearms rather than angled sidearms?**

  The choice of whether to use an angled or vertical sidearm is mainly based on versatility and ease of operation. It is easier to operate flasks and to position glass and stainless steel sensor probes into the medium of flasks with vertical sidearms than those with angled sidearms. Introducing gases into a flask with a tube positioned in a vertical orientation is easier than bending a tube through an angled sidearm configuration. In addition, when side arms are in a vertical orientation, more sidearms can be added and thus more fittings can be utilized in a vertical orientation creating more options for the end user.

- **Why choose an augmented and/or bioreactor process?**

  Augmenting your spinner flask for headspace overlays, direct sparging, media transfer, and/or pH and oxygen monitoring is mainly considered in order to increase cell density and productivity in the larger flasks. As cell culture volume increases, a decrease in cell density may occur due to factors such as nutrients and oxygen becoming limited in the flasks. While Corning spinner flasks are better than conventional flasks in dealing with these issues, additional operations are still needed to help overcome these limitations and boost productivity.

- **What type of augmented operation should I use?**

  There are a number of easy solutions to some of these limitations. A Corning Specialist can help you in configuring your flasks for these operations. The options available to you are detailed at the back of this manual in the Ordering section for sidearm fittings starting on page 35.

Optional Operation

Sidearm Fitting Accessories and Center Neck Cap Modifications

Corning provides a unique opportunity for achieving better performance from your spinner flasks. Accessories are available for both angled sidearm flasks and vertical sidearm flasks for augmented operations such as headspace overlays, direct sparging, media transfer and pH and oxygen monitoring. Positioning of the accessories is dependent on the desired unit operation. On angled sidearm flasks, the probes and certain operations can be mounted on the center neck cap, and further operations located on the sidearms. On vertical sidearm flasks, the sensors and most of the accessories are situated on the sidearms, and the center neck cap can be modified with smaller tubing for venting or additions of supplements. By combining sidearm fittings with the angled or vertical sidearm flasks and system controllers, sophisticated bioreactor operation can be easily achieved at a price considerably below the cost of buying an off-the-shelf unit from a fermenter manufacturer. The Unit Operations that can be created include:

- supplying or controlling additional gases (i.e. oxygen) to flasks in order to improve the exchange of the gas with the liquid medium
- adding and/or removing fresh medium in fed-batch operations to replenish spent nutrients in the medium
- performing in-line filtration of the culture medium using microporous filters to remove spent medium which may inhibit cell growth
- adding sensors and liquid addition ports into the vessel to help monitor and/or control pH, O_2 or temperature
- inoculating the cell culture medium at the beginning or during a cell culture process

For the larger vertical sidearm flasks, Corning offers overhead direct drive motors and drive shafts (see next section) for more consistent agitation with the larger volumes in the flasks. To determine the configuration of the flask and accessories you will need, please see our ordering section in the back of this manual. A few summarized, schematic circuit examples can be found on pages 28-29 that may meet your unit operation requirements. For any additional help, please contact your local Corning Application Specialist who can assist you further with any of the parts that you may need.

4519 – Accessories for ProCulture® Spinner Flasks

- All fittings are made of rugged PET with compression fittings and ferrules made of Noryl®.
- All fittings are designed to fit standard 45mm (GL-45) screw threads on ProCulture vessels.
- Securing caps are made of native polypropylene.
- Vent cap 4519-108 screw threads will accept most standard 50 mm 0.2 micron PTFE disposable filters.
- Media handling and gas delivery tubes are made of 316L stainless steel.
- Sensor fittings will accept most 12 mm insertion probes. O-ring made of Viton®.

For ordering and selection of any sidearm fittings, please see the Ordering and Spare Parts list in the back of this manual.

Direct Drive Stirring Systems and Cap/Drive Shaft Assemblies for Baffled Flasks

Agitation of the contents of Spinner Flasks at volumes greater than 8L can often become problematic using magnetic coupling. Drag created by the paddle blade can overcome the coupling of the magnet in the flask with the magnet in the magnetic stirrer below the flask. This effect becomes more pronounced as the volume in the flask increases. Although magnetic coupling may be sufficient to maintain the agitation in many cases, Corning offers an Overhead Direct Drive System for the many instances where higher agitation rates, greater volumes or higher viscosity or density cell culture such as microcarrier bead applications. The direct drive system can be used with angled sidearm flasks, but has its greatest utility with vertical sidearm flasks. The design of the vertical sidearm flasks allows the insertion of probes and tubes to more easily provide the sophisticated bioreactor operations that were mentioned earlier by moving these components to the periphery of the flask, allowing the center neck cap to be used for the drive shaft. The optional larger 120mm center neck opening makes setup of these flasks even easier.

- There are three components that are required for the use of the Direct Drive System:
  - Angled or Vertical Sidearm Flask
  - Drive Motor
  - Center Neck Cap with Drive Shaft Assembly.
  - Center neck cap and drive shaft assemblies will accept either 8000, 15000, or 36000 mL paddle assemblies, and will mate with ProCulture® direct drive motors.
- Optional cap assemblies are available to mate with other overhead drive motors. Contact Corning for more information.
- Drive shaft assembly and motors can be used on all 4510 and 4512 vertical sidearm flasks. Cap assemblies DO NOT INCLUDE direct drive paddles which must be purchased separately.
- Drive shaft housing made of rugged Noryl®, with internal Kevlar® composite bushings, PTFE spring-energized seals, internal air-space vent, and internal stainless steel drive shaft.
- Spring-energized seals ensure that shaft is truly sealed from the external environment unlike other drive units.
- Rugged high-torque drive motors deliver a constant 14.5 in-lbs of torque to a maximum speed of 350 rpm for easy stirring of viscous solution such as media with micro carrier beads.

4515 – Paddle Assemblies for Direct Drive Stirring Systems

- For 4510 and 4512-series flasks coupled to a Direct Drive Mechanism.
- Paddle Assemblies will couple to 100 or 120 Cap and Drive Shaft Assemblies.

For ordering, please go to our Ordering and Replacement Parts Lists at the end of this manual.

Flask Details

Schematic Circuits

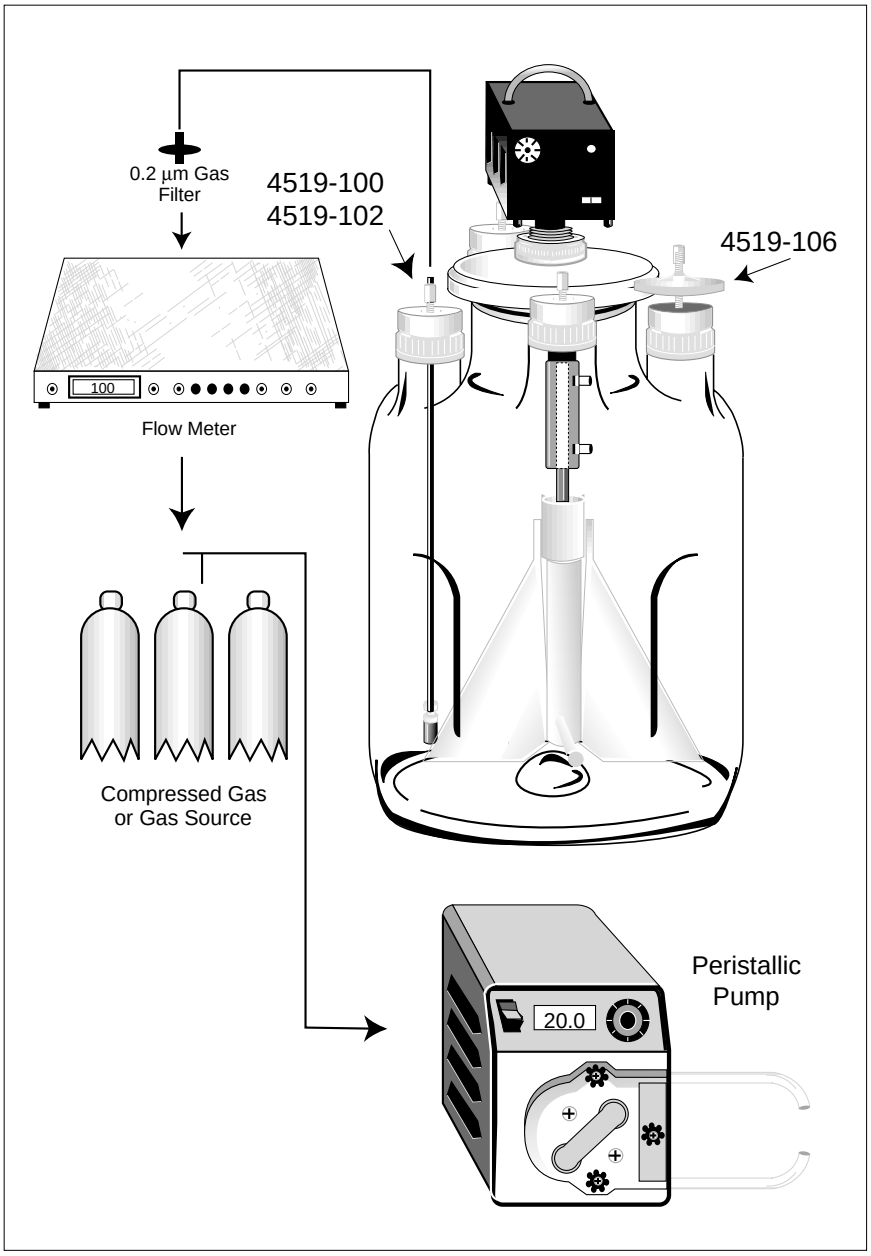


Figure 31. Continuous Sparging Schematic

Flask Details

Schematic Circuits

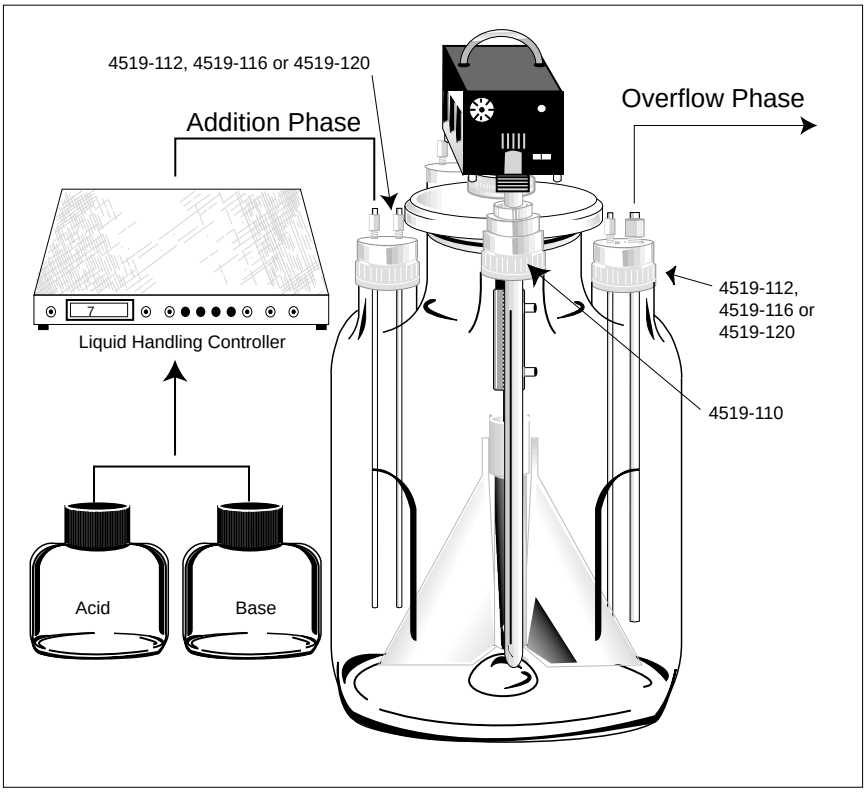


Figure 32. pH Control Schematic Diagram

Flask Details

ProCulture® 4500 & 4502-Series Flask Parts (See Figure 33)

4500-Series Flask, Spinner, 70/100 mm Center Neck, Magnetic, Complete
4502-Series Flask, Spinner, 120 mm Center Neck, Magnetic, Complete

Part	Description
BP-3405-xxx	***Replacement Flask with 70/100 mm Center Neck Opening***
BP-3505-xxx	***Replacement Flask with 120 mm Center Neck Opening***
A	Replacement Flask with 70/100 mm Center Neck Opening
A	Replacement Flask with 120 mm Center Neck Opening
BP-3402-100	***70 mm Cap Assembly, Magnetic-style, Complete, for 125 mL-250 mL Flasks***
BP-3403-100	***100 mm Cap Assembly, Magnetic-style, Complete, for 500 mL-1000 mL Flasks***
BP-3404-100	***100 mm Cap Assembly, Magnetic-style, Complete, for 3000 mL-36000 mL Flasks***
BP-3502-100	***120 mm Cap Assembly, Magnetic-style, Complete, for 3000 mL-36000 mL***
B	70 mm Cap, Screw Type
B	100 mm Cap, Screw Type
B	120 mm Cap, Screw Type
C	Cap Liner
D	Shaft Retaining Nut
BP-3401-xxx	***Impeller with Glass Shaft, Magnetic, Complete***
E	Paddle Bearing Holder
F	Paddle Blade
G	Paddle Polysulfone Rod (125 ml - 1L Flasks)
H	Paddle Glass Rod (3L - 36L Flasks)
I	Paddle s/s Rod (Optional, 125 mL - 36L Flasks)
J	Paddle Retaining Sleeve
K	Paddle Magnet
L	Paddle Silicone Plug
M	PTFE Split Ring (1 per Glass Rod, 2 per Polysulfone or s/s Rod)

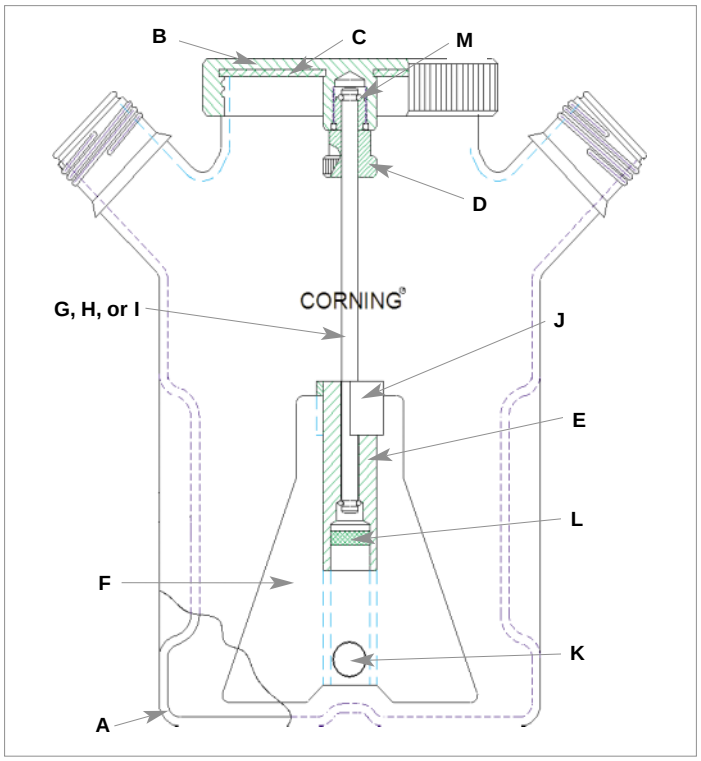


Figure 33. ProCulture® 4500 & 4502-Series Flask Parts

Flask Details

ProCulture® 4504-Series Flask, Spinner, 140 mm Center Neck, Magnetic, Complete (See Figure 34)

Flask with 140 mm Center Neck Opening, Complete

Part	Description
BP-3605-xxx	***Replacement Flask with 140mm Center Neck Opening***
BP-3602-xxx	***140mm Cap Assembly, Magnetic-style, Complete***
A	140 mm Cap Assembly, Magnetic-style, Complete
B	140 mm Cap, Compression, Upper Plate
C	140 mm Cap, Compression, Lower Plate
D	140 mm Cap, Seal Actuating Ring
E	140 mm Shaft Retaining Nut
F	140 mm Cap, Washer, Seal Actuating Ring
G	140 mm Cap, O-ring, Retaining, Size 123
H	140 mm Cap, Gasket, Compression Sealing, Size 428
BP-3401-xxx	***Impeller with Glass Shaft, Magnetic, Complete***
I	140 mm Paddle Bearing Holder
J	140 mm Paddle Blade
K	140 mm Paddle Glass Rod
L	140 mm Paddle s/s Rod (Optional)
M	140 mm Paddle Retaining Sleeve
N	140 mm Paddle Magnet
O	140 mm Paddle Silicone Plug
P	PTFE Split Ring (1 per Glass Rod, 2 per s/s Rod)

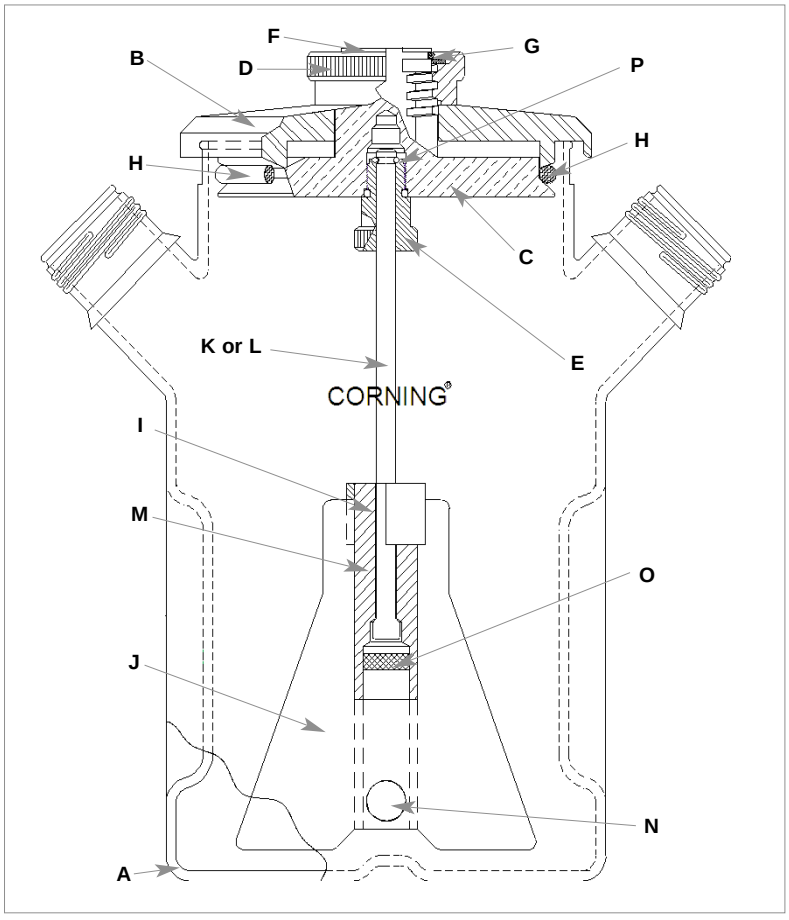


Figure 34. ProCulture® 4504-Series Flask, Spinner, 140 mm Center Neck, Magnetic, Complete

Flask Details

ProCulture® Direct Drive Detail, with 100/120 mm Cap Assembly (See Figure 35)

4510 & 4512-Series Flask with 100/120mm Center Neck Opening, Vertical Sidearms

Part	Description
4510/12-xxx	***Flask with 100/120 mm Center Neck Opening, Vertical Sidearms***
A	Replacement Flask with 100/120 mm Center Neck Opening
402614/400649	***100/120 mm Cap Assembly Complete, Direct Drive-Style***
B	100/120 mm Cap, Screw Type
C	Cap Lock Nut
D	Cap Liner
E	Drive Pin
F	Spacer
G	Bearing, Upper, Torlon®
H	Polymer Bearing, Lower, 1/4" x 5/8"
I	Seal Assembly, Direct Drive
J	Nut, Luer Lock, Polypropylene
K	Shaft Housing
L	S/S Shaft
M	Shaft O-ring
N	Fitting, Male Luer x 1/4"-28, Polypropylene
O	13mm 0.2 micron PTFE Filter
–	Snap Ring (Not Shown)

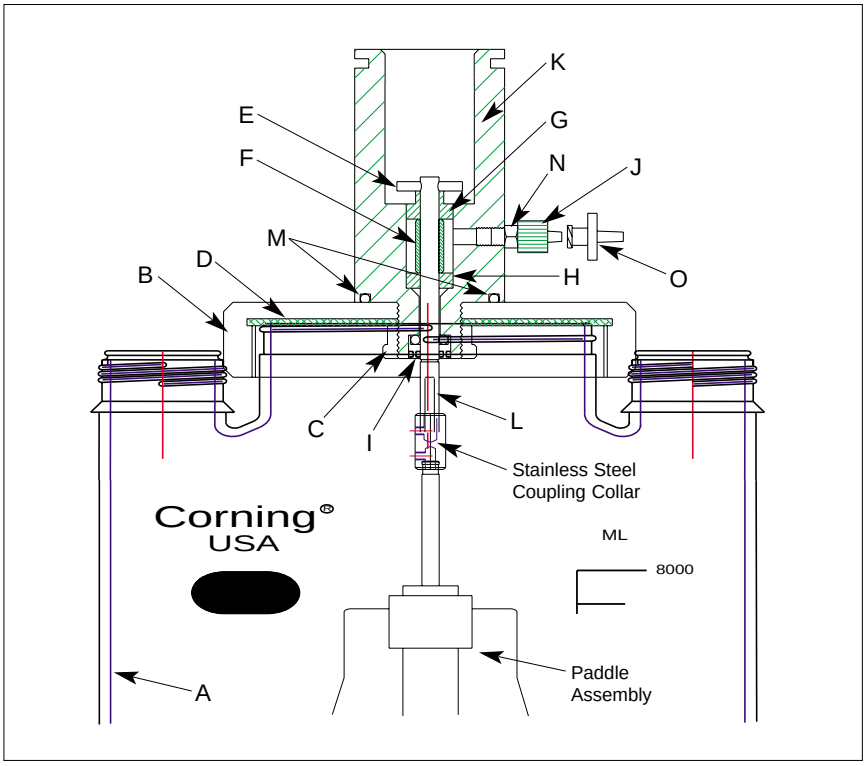


Figure 35. ProCulture® Direct Drive Detail, with 100/120mm Cap Assembly

Flask Details

ProCulture® Spinner Flasks 4510/12-series, 100/120mm Center Neck Flask Fitted with 402614/400649 Direct Drive (See Figure 36)

4510/12-Series Flask with 100/120 mm Center Neck Opening, Vertical Sidearms

Part	Description
4510/12-xxx	***Flask with 100/120 mm Center Neck Opening, Vertical Sidearms***
A	Replacement Flask with 100/120mm Center Neck Opening
402614/400649	***100/120 mm Cap Assembly-Direct Drive Style, Complete for ProCulture Direct Drive***
B	100/120 mm Cap
C	100/120 mm Cap Liner
D	Direct Drive Shaft Assembly
E	S/S Coupling Collar
4515-xxx	***Direct Drive Paddle Assembly Complete with S/S Shaft***
F	Direct Drive Paddle Bearing Holder
G	Direct Drive Paddle Blade
H	Direct Drive Paddle S/S Rod
I	Direct Drive Paddle Retaining Sleeve
J	Direct Drive Paddle Retaining Plug

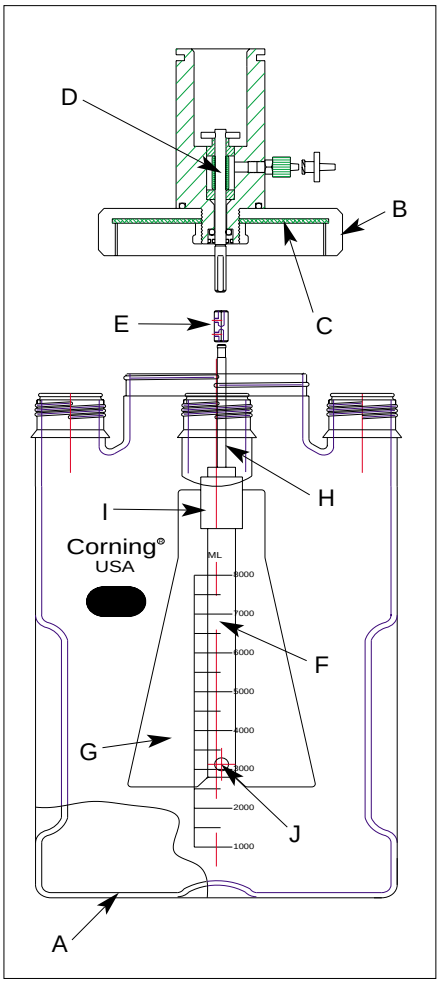


Figure 36. ProCulture 4510/12-Series, 100/120 mm Center Neck Flask Fitted with 402614/400649 Direct Drive

Spinner Flask Components Chemical Compatibility Chart

Component	FDA Composition	Chemical Resistance: Compliant	Acid Autoclavable	Base (1 N HCl)	(1 N NaOH)	Organics*
Flask						
Glass	(Corning® 7740) Type I Borosilicate	Yes	Yes	Yes	Yes	Yes
Cap Assemblies						
Shur-Loc® Head-Plates	Polypropylene	Yes	Yes	Yes	Yes	+/-
Center Neck Screw Caps	Valox® 420	Yes	Yes	Yes	Yes	+/-
Sidearm Screw Caps	Polypropylene	Yes	Yes	Yes	Yes	+/-
Shaft Retaining Nut	ULTEM® 1000	Yes	Yes	Yes	Yes	+/-
Shur-Loc Head-Plate						
Compression Sealing						
Gasket	Silicone	Yes	Yes	Yes	Yes	+/-
O-ring	Silicone	Yes	Yes	Yes	Yes	+/-
Seal Actuating Ring	PET	Yes	Yes	Yes	Yes	+/-
Seal Actuating Ring	PET	Yes	Yes	Yes	Yes	+/-
Washer						
Paddle Assemblies						
Bearing Holder	PTFE	Yes	Yes	Yes	Yes	+/-
Paddle Blade	PTFE	Yes	Yes	Yes	Yes	+/-
Magnet	Encased PTFE	Yes	Yes	Yes	Yes	+/-
Stainless Steel Shaft	316L	Yes	Yes	Yes	Yes	+/-
Glass Shaft	(Corning 7740) Type I Borosilicate	Yes	Yes	Yes	Yes	+/-
Plastic Shafts	Polysulfone	Yes	Yes	Yes	Yes	+/-
Bearing Media Plug	Silicone	Yes	Yes	Yes	Yes	+/-
Bearing Thrust Washer	PTFE	Yes	Yes	Yes	Yes	+/-
Blade Retaining Sleeve	PTFE	Yes	Yes	Yes	Yes	+/-
Direct Drive Assembly						
Thrust Washer/Bearings	Torlon® 4301	Yes	Yes	Yes	Yes	+/-
Shaft O-ring	Viton®	Yes	Yes	Yes	Yes	+/-
Shaft Housing	Noryl®	Yes	Yes	Yes	Yes	+/-
Metal Components	316 Stainless Steel	Yes	Yes	Yes	Yes	+/-
Vent Fitting	Polypropylene	Yes	Yes	Yes	Yes	+/-
Shaft Seal Housing	Hydlar® ZF	Yes	Yes	Yes	Yes	+/-
Shaft Seals	Teflon® Proprietary	Yes	Yes	Yes	Yes	+/-
Cap Lock Nut	PET	Yes	Yes	Yes	Yes	+/-
Snap Ring	316 Stainless Steel	Yes	Yes	Yes	Yes	+/-

Product	Chemical Composition*
Viton®	Fluoroelastomer
Noryl®	Polyphenylene Oxide, EN-265
PET	Polyethylene Terephthalate
Hydlar® ZF	Kevlar/Nylon
Teflon®	PTFE
Torlon® 4301	Polyamide-imide
Valox® 420	PBT 30% glass
ULTEM® 1000	Polyetherimide
PBT	Polybutylene Terephthalate

*For more detailed information on chemical resistivity, please contact the manufacturer.

Ordering Information

Corning Life Sciences is currently transitioning ProCulture® Spinner Flask spare parts to Wilmad-Lab Glass. For ordering and technical service of all products that have BP-xxxx-xxx part numbers, please call 1.800.220.5171 ext. 686 in the U.S. Outside the U.S., please call 001.856.697.3000 ext. 686.

For all other part numbers that are not associated with a BP-xxxx-xxx part number, please call Corning Incorporated at 1.800.492.1110 in the U.S. Outside the U.S., please call your local Corning Representative.

4500-1L and 4500-250
Spinner Flasks

ProCulture Spinner Flasks

ProCulture® Glass Spinner Flask with Angled Sidearms

- Baffles enhance aeration and agitation of contents of the flask.
- Unique impeller design ensures optimal stirring.
- Sidearm designs permit easy access of 25 and 50 mL pipettes
- Visit **www.corning.com/lifesciences** to view additional Corning® spinner flask accessories

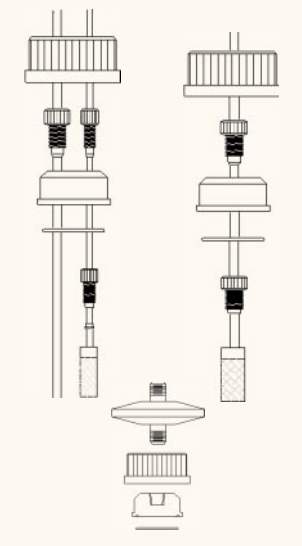
ProCulture Spinner Flasks with Angled Sidearms Ordering Information

Cat. No.	Description	Capacity	Center Neck (mm)	Sidearm Neck (mm)	Qty/ Case
4500-125	Spinner	125 mL	70	32	1
4500-250	Spinner	250 mL	70	32	1
4500-500	Spinner	500 mL	100	45	1
4500-1L	Spinner	1L	100	45	1
4500-3L	Spinner	3L	100	45	1
4500-6L	Spinner	6L	100	45	1
4500-8L	Spinner	8L	100	45	1
4500-15L	Spinner	15L	100	45	1
4500-36L	Spinner	36L	100	45	1
4502-3L	Spinner	3L	120	45	1
4502-6L	Spinner	6L	120	45	1
4502-8L	Spinner	8L	120	45	1
4502-15L	Spinner	15L	120	45	1
4502-36L	Spinner	36L	120	45	1
4504-3L	Spinner	3L	140	45	1
4504-6L	Spinner	6L	140	45	1
4504-8L	Spinner	8L	140	45	1
4504-15L	Spinner	15L	140	45	1
4504-36L	Spinner	36L	140	45	1

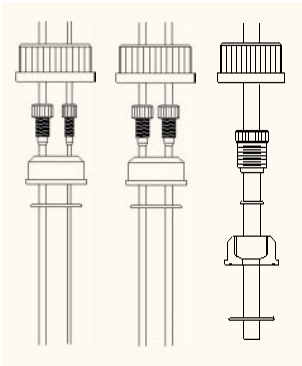
Retrofit Kits are available for converting older Corning® ProCulture Spinner Flasks to fit newer dual-bearing impellers.

ProCulture Spinner Flasks with Vertical Sidearms Ordering Information

Cat. No.	Capacity	Center Neck (mm)	Number of Vertical Sidearms	Sidearm Neck (mm)	Qty/ Case
4510-8L	8L	100	4	45	1
4510-15L	15L	100	4	45	1
4510-36L	36L	100	6	45	1
4512-8L	8L	120	4	45	1
4512-15L	15L	120	4	45	1
4512-36L	36L	120	6	45	1
4514-15L	15L	140	4	45	1
4514-36L	36L	140	6	45	1



Vertical Sidearm Fittings, Gas Delivery and Venting



Vertical Sidearm Fittings, Media Handling

Gas Handling Fittings, Vertical Sidearm Flasks

- Used to provide gases into larger spinner flasks with vertical sidearms
- Fittings are comprised of a PET insert with a Viton® O-Ring and a polypropylene sealing cap
- Gas filters are PTFE, 0.2 µm porosity
- The 316 stainless steel tubes are held in place by Noryl® nuts with integrated ferrules
- The fittings are completely autoclavable

Gas Handling Fittings, Vertical Sidearm Flasks Ordering Information

Cat. No.	Description	Dimension	Qty/Case
4519-100	Sidearm fitting, gas delivery	1/8" Inlet	1
4519-102	Sidearm fitting, gas delivery	1/4" Inlet	1
4519-104	Sidearm fitting, delivery and vent	1/8" and 1/4"	1
4519-106	Sidearm fitting, vent cap, 0.2 µm	50 mm filter	1
4519-177	Sidearm fitting, vent cap, 0.2 µm, Sanitary	50 mm filter	1

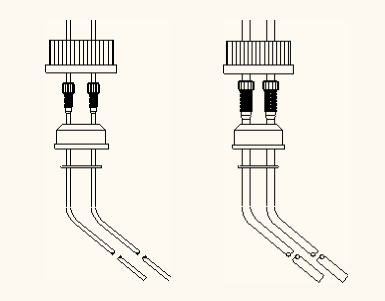
Media Handling Fittings, Vertical Sidearm Flasks

- Used to introduce medium aseptically into large spinner flasks with vertical sidearms
- Fittings are comprised of a PET insert with a Viton O-Ring and a polypropylene sealing cap
- Gas filters are PTFE, 0.2 µm porosity
- The 316 stainless steel tubes are held in place by Noryl nuts with integrated ferrules
- The fittings are completely autoclavable

Media Handling Fittings, Vertical Sidearm Flasks Ordering Information

Cat. No.	Description	Fits Flask Size	Tubing O.D. (inches)	Qty/ Case
4519-112	Sidearm fitting, dual, media handling	8L, 15L	1/8"	1
4519-114	Sidearm fitting, dual, media handling	36L	1/8"	1
4519-116	Sidearm fitting, dual, media handling	8L, 15L	1/4"	1
4519-118	Sidearm fitting, dual, media handling	36L	1/4"	1
4519-120	Sidearm fitting, combo, media handling	8L, 15L	1/8", 1/4"	1
4519-122	Sidearm fitting, combo, media handling	36L	1/8", 1/4"	1
4519-124	Sidearm fitting, single, media handling	8L,15L	1/2"	1
4519-126	Sidearm fitting, single, media handling	36L	1/2"	1
4519-176	Sidearm fitting, dual, media handling, EPDM	8L, 15L	1/4"	1

Gas or Media Handling Fittings, Angled Sidearm Flasks, Dual Style



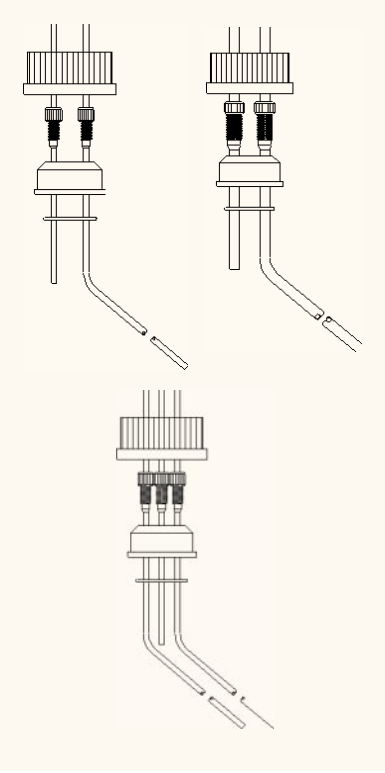
Dual Angled Sidearm Fittings

- Dual angled sidearm fittings can be used for aseptically transferring medium into or out of angled sidearm spinner flasks or for sparging the medium with gases
- Fittings are comprised of a PET insert with a Viton® O-ring and a polypropylene sealing cap
- Two 316 stainless steel tubes which extend to the bottom of the flask, are held in place by Noryl® nuts with integrated ferrules
- The fittings are completely autoclavable

Gas or Media Handling Fittings, Angled Sidearm Flasks, Dual Style Ordering Information

Cat. No.	Description	Flask Size	Tubing O.D. (inches)	Qty/ Case
4519-150	SA fitting, Dual	1L	1/8"	1
4519-151	SA fitting, Dual	3L	1/8"	1
4519-152	SA fitting, Dual	6L	1/8"	1
4519-153	SA fitting, Dual	8L	1/8"	1
4519-173	SA fitting, Dual	1L	1/8", 1/4"	1
4519-121	SA fitting, Dual	8L	1/8", 1/4"	1
4519-174	Sidearm fitting, Dual	500 mL	1/8" angled to 125 mL level, 1/4"	1
4519-154	Sidearm fitting, Dual	1L	1/4"	1
4519-155	Sidearm fitting, Dual	3L	1/4"	1
4519-156	Sidearm fitting, Dual	6L	1/4"	1
4519-157	Sidearm fitting, Dual	8L	1/4"	1
4519-170	Sidearm fitting, Dual	15L	1/4"	1

Gas or Media Handling Fittings, Angled Sidearm Flasks, Combination Style

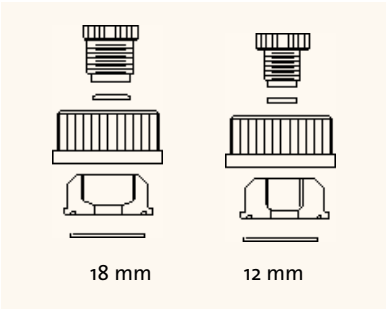


Combination and Triple Angled Sidearm Fittings

- Used to aseptically transfer medium, sparge the cell culture medium directly or add gases to the head space above the cell culture medium
- Fittings are comprised of a PET insert with a Viton O-ring and a polypropylene sealing cap
- One or two 316 stainless steel tubes extend to the bottom of the flask; the other is a shorter 6" length
- Both tubes are held in place by Noryl nuts with integrated ferrules
- The fittings are completely autoclavable

Gas or Media Handling Fittings, Angled Sidearm Flasks, Combination Style Ordering Information

Cat. No.	Description	Flask Size	Tubing O.D. (inches)	Qty/ Case
4519-158	Sidearm fitting, combination	1L	1/8"	1
4519-159	Sidearm fitting, combination	3L	1/8"	1
4519-160	Sidearm fitting, combination	6L	1/8"	1
4519-161	Sidearm fitting, combination	8L	1/8"	1
4519-162	Sidearm fitting, combination	1L	1/4"	1
4519-163	Sidearm fitting, combination	3L	1/4"	1
4519-164	Sidearm fitting, combination	6L	1/4"	1
4519-165	Sidearm fitting, combination	8L	1/4"	1
4519-171	Sidearm fitting, combination	15L	1/4"	1
4519-166	Sidearm fitting, combination, triple	1L	1/8"	1
4519-167	Sidearm fitting, combination, triple	3L	1/8"	1
4519-168	Sidearm fitting, combination, triple	6L	1/8"	1
4519-169	Sidearm fitting, combination, triple	8L	1/8"	1



Sidearm Fittings for Sensors

Fittings for Insertion Probes, Vertical Sidearm Flasks

- Used to secure pH, O_2, or temperature sensors in large spinner flasks with vertical sidearms
- Fittings are comprised of a PET insert with a Viton® O-ring and a polypropylene sealing cap
- The 316 sensors are held in place by Noryl® nuts with integrated ferrules
- The fittings are completely autoclavable

Fittings for Insertion Probes, Vertical Sidearm Flasks Ordering Information

Cat. No.	Description	Sensor O.D. (mm)	Qty/ Case
4519-108	Sidearm fitting, sensor, O_2 probes	12	1
4519-128	Sidearm fitting, sensor, temperature probes	12	1
4519-110	Sidearm fitting, sensor, pH probes	12	1
4519-172	Sidearm fitting, sensor, pH or O_2	18	1

Impeller Assembly

Impeller Assembly for Magnetically-Driven Bioreactor

Stainless steel impeller shaft with modified impeller blade for use with probes to create a small bioreactor.

Impeller Assembly for Magnetically-Driven Bioreactor Ordering Information

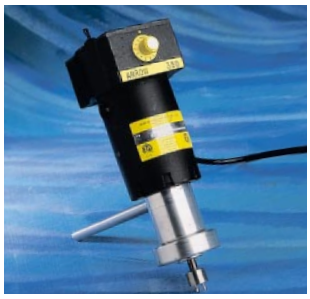
Cat. No.	Description	Qty/Cs
402648	Impeller assembly, stainless steel, dual bearing, modified for probes, 3L	1
402649	Impeller assembly, stainless steel, dual bearing, modified for probes, 6L	1
401392	Impeller assembly, stainless steel, dual bearing, modified for probes, 8L	1
401661	Impeller assembly, stainless steel, dual bearing, modified for probes, 15L	1
402650	Impeller assembly, stainless steel, dual bearing, modified for probes, 36L	1

Cap Assembly for Magnetically-Driven Bioreactor

Cap assembly for small biorecator with various fitting arrangements.

Cap Assembly for Magnetically-Driven Bioreactor Ordering Information

Cat. No.	Description	Qty/Case
402579	Cap Assembly, 120 mm, Glass Filled PBT, 3 (3/8"), 1 (1/4") fittings	1
402576	Cap Assembly, 120 mm, Glass Filled PBT, 2 (12 mm), 2 (1/4") fittings	1
402577	Cap Assembly, 120 mm, Glass Filled PBT, 2 (12 mm), 2 (1/4"), 1 (3/8") fittings	1



Direct Drive Motor

Direct Drive Motors

- High torque, low rpm stirrer designed to maintain constant low speed
- Gearhead stirrer delivers 14.5 in-lbs of torque
- Maximum speed is 350 rpm
- Weight of motor is 9 lbs (4.1kg)
- Available with 120VAC 60Hz or 230VAC 50Hz

Direct Drive Motors Ordering Information

Cat. No.	Description	Qty/Case
400640	120VAC, 60 Hz Motor	1
402645	230VAC, 50 Hz Motor	1

Direct Drive Shaft/Cap Assembly

Direct Drive Shaft/Cap Assemblies

- For 8L, 15L, or 36L paddle assemblies
- Used on all series 4510 and 4512 Spinner flasks

Direct Drive Shaft/Cap Assemblies Ordering Information

Cat. No.	Description	Qty/Case
402614	For 100 mm Neck Flasks	1
402649	For 120 mm Neck Flasks	1

Direct Drive Paddle Assembly

Direct Drive Paddle Assemblies

- For series 4510, 4512, and 4514 Spinner flasks when coupled to a direct drive motor
- Paddle assemblies will couple to 100 mm and 120 mm cap assemblies

Direct Drive Paddle Assemblies Ordering Information

Cat. No.	Description	Qty/Case
4515-8L	Paddle assembly only for 8L flask	1
4515-15L	Paddle assembly only for 15L flask	1
4515-36L	Paddle assembly only for 36L flask	1

Replacement Parts for Spinner Flasks

Replacement Parts for Spinner Flasks

Replacement Flasks, Complete

BP-3405-100	Replacement Flask w/ 70 mm Center Neck Opening 125 mL
BP-3405-102	Replacement Flask w/ 70 mm Center Neck Opening 250 mL
BP-3405-104	Replacement Flask w/ 100 mm Center Neck Opening 500 mL
BP-3405-106	Replacement Flask w/ 100 mm Center Neck Opening 1000 mL
BP-3405-108	Replacement Flask w/ 100 mm Center Neck Opening 3000 mL
BP-3405-110	Replacement Flask w/ 100 mm Center Neck Opening 6000 mL
BP-3405-112	Replacement Flask w/ 100 mm Center Neck Opening 8000 mL
BP-3405-114	Replacement Flask w/ 100 mm Center Neck Opening 15000 mL
BP-3405-116	Replacement Flask w/ 100 mm Center Neck Opening 36000 mL
BP-3505-108	Replacement Flask w/ 120 mm Center Neck Opening 3000 mL
BP-3505-110	Replacement Flask w/ 120 mm Center Neck Opening 6000 mL
BP-3505-112	Replacement Flask w/ 120 mm Center Neck Opening 8000 mL
BP-3505-114	Replacement Flask w/ 120 mm Center Neck Opening 15000 mL
BP-3505-116	Replacement Flask w/ 120 mm Center Neck Opening 36000 mL
BP-3605-108	Replacement Flask w/ 140 mm Center Neck Opening 3000 mL
BP-3605-110	Replacement Flask w/ 140 mm Center Neck Opening 6000 mL
BP-3605-112	Replacement Flask w/ 140 mm Center Neck Opening 8000 mL
BP-3605-114	Replacement Flask w/ 140 mm Center Neck Opening 15000 mL
BP-3605-116	Replacement Flask w/ 140 mm Center Neck Opening 36000 mL
BP-3700-112	Replacement Flask, Spinner, 100 mm Center Neck 8000 mL, Four 45 mm Vertical Sidearms
BP-3700-114	Replacement Flask, Spinner, 100 mm Center Neck 15000 mL, Four 45 mm Vertical Sidearms
BP-3700-116	Replacement Flask, Spinner, 100 mm Center Neck 36000 mL, Six 45 mm Vertical Sidearms
BP-3700-212	Replacement Flask, Spinner, 120 mm Center Neck 8000 mL, Four 45 mm Vertical Sidearms
BP-3700-214	Replacement Flask, Spinner, 120 mm Center Neck 15000 mL, Four 45 mm Vertical Sidearms
BP-3700-215	Replacement Flask, Spinner, 120 mm Center Neck 15000 mL, Six 45 mm Vertical Sidearms
BP-3700-216	Replacement Flask, Spinner, 120 mm Center Neck 36000 mL, Six 45 mm Vertical Sidearms
BP-3700-314	Replacement Flask, Spinner, 140 mm Center Neck 15000 mL, Four 45 mm Vertical Sidearms
BP-3700-316	Replacement Flask, Spinner, 140 mm Center Neck 36000 mL, Six 45 mm Vertical Sidearms

Impeller Assemblies, Complete

BP-3401-100	Impeller w/PS Shaft, Magnetic, Complete 125 mL
BP-3401-102	Impeller w/PS Shaft, Magnetic, Complete 250 mL
BP-3401-104	Impeller w/PS Shaft, Magnetic, Complete 500 mL
BP-3401-106	Impeller w/PS Shaft, Magnetic, Complete 1000 mL
BP-3401-108	Impeller w/Glass Shaft, Magnetic, Complete 3000 mL
BP-3401-110	Impeller w/Glass Shaft, Magnetic, Complete 6000 mL
BP-3401-112	Impeller w/Glass Shaft, Magnetic, Complete 8000 mL
BP-3401-114	Impeller w/Glass Shaft, Magnetic, Complete 15000 mL
BP-3401-116	Impeller w/Glass Shaft, Magnetic, Complete 36000 mL

Impeller Assembly Components

Bearing Holders

BP-3411-010	Paddle Bearing Holders 125 mL
BP-3411-011	Paddle Bearing Holders 250 mL
BP-3411-012	Paddle Bearing Holders 500 mL
BP-3411-013	Paddle Bearing Holders 1000 mL
BP-3411-014	Paddle Bearing Holders 3000 mL
BP-3411-015	Paddle Bearing Holders 6000 mL
BP-3411-016	Paddle Bearing Holders 8000 mL
BP-3411-017	Paddle Bearing Holders 15000 mL
BP-3411-018	Paddle Bearing Holders 36000 mL

Paddle Blades

BP-3411-020	Paddle Blades 125 mL
BP-3411-021	Paddle Blades 250 mL
BP-3411-022	Paddle Blades 500 mL
BP-3411-023	Paddle Blades 1000 mL
BP-3411-024	Paddle Blades 3000 mL
BP-3411-025	Paddle Blades 6000 mL
BP-3411-026	Paddle Blades 8000 mL
BP-3411-027	Paddle Blades 15000 mL
BP-3411-028	Paddle Blades 36000 mL
BP-3411-9022	Paddle Blades 500 mL, Mod/Probes
BP-3411-9023	Paddle Blades 1000 mL, Mod/Probes
BP-3411-9024	Paddle Blades 3000 mL, Mod/Probes
BP-3411-9025	Paddle Blades 6000 mL, Mod/Probes
BP-3411-9026	Paddle Blades 8000 mL, Mod/Probes
BP-3411-9027	Paddle Blades 15000 mL, Mod/Probes
BP-3411-9028	Paddle Blades 36000 mL, Mod/Probes

Paddle PTFE Split Ring/Thrust Bearing Washers

BP-3411-030	Paddle Split Ring/Thrust Bearing Washers, for 1/4" O.D. Stainless Steel Shaft
BP-3411-031	Paddle Split Ring/Thrust Bearing Washers, for 5/16" O.D. Stainless Steel Shaft

For ordering and technical service of all BP-3xxx-xxx part numbers, please call Wilmad LabGlass at 1.800.220.5171 ext. 686 in the U.S. Outside the U.S., please call 001.856.697.3000 ext. 686.

*For all other part numbers, please call Corning Incorporated at 1.800.492.1110 in the U.S. Outside the U.S., please call your local Corning Representative.

Replacement Parts for Spinner Flasks

Paddle Retaining Sleeves

BP-3411-050 Paddle Retaining Sleeves 125 mL - 500 mL
BP-3411-053 Paddle Retaining Sleeves 1000 mL
BP-3411-055 Paddle Retaining Sleeves 3000 mL - 8000 mL
BP-3411-057 Paddle Retaining Sleeves 15000 mL - 36000 mL

Paddle Magnets

BP-3411-060 Paddle Magnets, for 250 mL & 500 mL Flask 3/8" x 2"
BP-3411-061 Paddle Magnets, for 1000 mL Flask 1/2" x 3"
BP-3411-062 Paddle Magnets, for 3000 mL - 8000 mL Flask 5/8" x 4"
BP-3411-063 Paddle Magnets, for 15000 mL - 36000 mL Flask 3/4" x 3-1/4"
BP-3411-068 Paddle Magnets, for 125 mL Flask 3/8" x 1-1/2"

Paddle Rods, Polysulfone or Glass, Dual Bearing

BP-3411-170 Paddle Polysulfone Rods, 125 mL, 6 mm O.D.
BP-3411-170 Paddle Polysulfone Rods, 250 mL, 6 mm O.D.
BP-3411-172 Paddle Polysulfone Rods, 500 mL, 6 mm O.D.
BP-3411-173 Paddle Polysulfone Rods, 1000 mL, 6 mm O.D.
BP-3411-174 Paddle Glass Rods 3000 mL, 8 mm O.D.
BP-3411-175 Paddle Glass Rods 6000 mL, 8 mm O.D.
BP-3411-176 Paddle Glass Rods 8000 mL, 8 mm O.D.
BP-3411-177 Paddle Glass Rods 15000 mL, 8 mm O.D.
BP-3411-176 Paddle Glass Rods 36000 mL, 8 mm O.D.

Paddle Rods, Stainless Steel, Dual Bearing

BP-3611-081 Paddle Stainless Steel Rods 125 mL, 1/4" O.D.
BP-3611-081 Paddle Stainless Steel Rods 250 mL, 1/4" O.D.
BP-3611-082 Paddle Stainless Steel Rods 500 mL, 1/4" O.D.
BP-3611-083 Paddle Stainless Steel Rods 1000 mL, 1/4" O.D.
BP-3611-084 Paddle Stainless Steel Rods 3000 mL, 5/16" O.D.
BP-3611-085 Paddle Stainless Steel Rods 6000 mL, 5/16" O.D.
BP-3611-086 Paddle Stainless Steel Rods 8000 mL, 5/16" O.D.
BP-3611-087 Paddle Stainless Steel Rods 15000 mL, 5/16" O.D.
BP-3611-088 Paddle Stainless Steel Rods 36000 mL, 5/16" O.D.

Paddle Silicon Plugs

BP-3411-090 Paddle Silicon Plugs 125 mL - 1000 mL
BP-3411-095 Paddle Silicon Plugs 3000 mL - 36000 mL

Direct Drive Bearing Holders

BP-3711-016 Direct Drive Paddle Blade Holder with Stainless Steel Shaft, 8000 mL
BP-3711-017 Direct Drive Paddle Blade Holder with Stainless Steel Shaft, 15000 mL
BP-3711-018 Direct Drive Paddle Blade Holder with Stainless Steel Shaft, 36000 mL

Direct Drive Paddle Retaining Plug

BP-3711-066 Direct Drive Paddle Retaining Plug

Direct Drive Coupling Collar

BP-3711-096 Stainless Steel Coupling Collar
BP-3711-094 Screw,Set,For Coupling Collar, 1/4-20 X 1/4", 316 Stainless Steel

Direct Drive Paddle Blades

BP-3711-026 Paddle Blades 8000 mL
BP-3711-027 Paddle Blades 15000 mL
BP-3711-028 Paddle Blades 36000 mL

Cap Assemblies, Complete

BP-3402-100 70 mm Cap Assembly, Magnetic-style, Complete, for 125 mL-250 mL Flasks
BP-3403-100 100 mm Cap Assembly, Magnetic-style, Complete, 1/4" (6 mm), for 500 mL-1000 mL Flasks
BP-3404-100 100 mm Cap Assembly, Magnetic-style, Complete, 5/16" (8 mm), for 3L-36L Flasks
BP-3404-100 120 mm Cap Assembly, Magnetic-style, Complete, for 3L-36L Flasks
BP-3602-100 140 mm Cap Assembly, Magnetic-style, Complete, for 3L-36L Flasks
BP-3504-106 120 mm Cap Assembly, Magnetic-style, Complete, with 2 (12 mm) Fittings
BP-3504-112 120 mm Cap Assembly, Magnetic-style, Complete, with 2 (12 mm) and 2 (1/4") Fittings

Cap Assembly Components

Center Neck Caps

BP-3412-011 70 mm Cap, Screw Type, with Integrated Compression Fitting (ICF)
BP-3412-015 Liner, 70 mm with Center Hole, Red Silicone
BP-3413-011 100 mm Cap, Screw Type, with ICF
BP-3413-015 Liner, 100 mm with Center Hole, Red Silicone
BP-3516-011 120 mm Cap, Screw Type, with ICF
BP-3513-015 Liner, 120 mm,with Center Hole, Red Silicone
BP-3518-012 120 mm Cap,Screw Type, with ICF, with 2 (12 mm) Holes
BP-3513-016 Liner, 120 mm, with Center Hole,Red Silicone, with 2 (12 mm) Holes
BP-3518-015 120 mm Cap,Screw Type, with ICF, with 2 (12 mm), 2 (1/4") Holes
BP-3514-016 Liner, 120 mm,with Center Hole, Red Silicone, with 2 (12 mm), 2 (1/4") Holes
BP-3612-010 140 mm Cap, Compression, Lower Plate with Flats
BP-3612-020 140 mm Cap, Compression, Upper Plate with Flats
BP-3612-030 140 mm Cap, Seal Actuating Ring
BP-3612-050 140 mm Cap, Washer, Seal Actuating Ring
BP-3612-060 140 mm Cap, O-ring, Retaining, Size 123
BP-3612-070 140 mm Cap, Gasket, Compression Sealing, Size 428

Nut, Shaft Retaining

BP-3413-9041 Nut, Shaft Retaining, for 1/4" O.D. (6 mm) Shafts, ULTEM
BP-3413-9042 Nut, Shaft Retaining, for 5/16" O.D. (8 mm) Shafts, ULTEM
BP-3812-005 O-ring for Shaft Retaining Nut

Direct Drive Cap Lock Washer

BP-3921-005 Direct Drive Cap Compression Fitting Lock Washer

For ordering and technical service of all BP-3xxx-xxx part numbers, please call Wilmad LabGlass at 1.800.220.5171 ext. 686 in the U.S. Outside the U.S., please call 001.856.697.3000 ext. 686.

*For all other part numbers, please call Corning Incorporated at 1.800.492.1110 in the U.S. Outside the U.S., please call your local Corning Representative.

Replacement Parts for Spinner Flasks

Replacement Parts for Spinner Flask Sidearm Fittings

PET Inserts

BP-3802-001	45 mm PET Insert for Single 1/8" Inlet
BP-3803-001	45 mm PET Insert for Single 1/4" Inlet
BP-3807-001	45 mm PET Insert for 50 mm Filter
BP-3812-001	45 mm PET Insert for 12 mm Insertion Probes
BP-3822-001	45 mm PET Insert for Dual 1/8" Media Handling Sidearm Fitting
BP-3827-001	45 mm PET Insert for Dual 1/4" Media Handling Sidearm Fitting
BP-3832-001	45 mm PET Insert for Combination 1/8" - 1/4" Media Handling Sidearm Fitting
BP-3832-002	45 mm,PET Insert for Triple 1/8" Inlet

Stainless Steel Tubing

BP-3802-007	316 Stainless Steel Tubing, 1/8" O.D. x 18", For 8L and 15L Flasks
BP-3803-007	316 Stainless Steel Tubing, 1/4" O.D., Threaded x 18", For 8L and 15L Flasks
BP-3822-007	316 Stainless Steel Tubing, 1/8" O.D. x 21", For 36L Flasks
BP-3827-007	316 Stainless Steel Tubing, 1/4" O.D. x 21", For 36L Flasks

Angled Sidearm Replacement Tubing – Please Contact Corning Customer Service

Compression Nuts & Ferrules

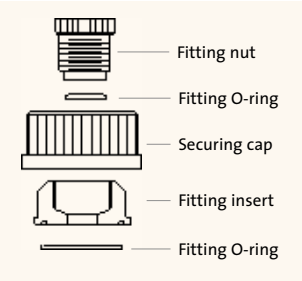
BP-3802-004	1/8" Nut, Noryl
BP-3803-004	1/4" Nut, Noryl
BP-3812-004	12.4 mm Nut, Noryl
BP-3847-008	1/8" Plug, Delrin
BP-3852-008	1/4" Plug, Delrin
BP-3857-008	12 mm/1/2" Plug, Delrin

Caps, O-rings, Filters, and Caps

BP-3802-002	Insert O-ring, Viton
BP-3802-003	45 mm Securing Cap, Bored
BP-3802-006	Stainless Steel Sparging Stone & Nut, Complete, 10 micron Mesh
BP-3807-004	50 mm PTFE Filter, 0.2 micron, NPT ends
BP-3812-005	O-ring for 12.4 mm Nut
1395-45LTMC*	Corning 45 mm Low Temperature Vent Cap with 0.22 micron Filter

Securing Caps

BP-3802-003	Cap, securing, 45 mm, bored, orange
BP-3872-002	Cap, securing, 45 mm, bored, for injection septum, white
1395-32LTC	Cap, solid, 32 mm, orange
1395-45LTC	Cap, solid, 45 mm, orange
1395-45LTR	Drip ring, 45 mm, clear
1395-45LTMC	Cap, vented, securing, 45 mm, .22 PTFE, grey



Spinner Flask Shaft Retrofit Kits

Retrofit Kits, Dual Bearing Shafts, Polysulfone or Glass

BP-3401-400	Retrofit Kit, Polysulfone Shaft, 125 mL
BP-3401-401	Retrofit Kit, Polysulfone Shaft, 250 mL
BP-3401-402	Retrofit Kit, Polysulfone Shaft, 500 mL
BP-3401-403	Retrofit Kit, Polysulfone Shaft, 1000 mL
BP-3401-404	Retrofit Kit, Glass Shaft, 3000 mL
BP-3401-405	Retrofit Kit, Glass Shaft, 6000 mL
BP-3401-406	Retrofit Kit, Glass Shaft, 8000 mL
BP-3401-407	Retrofit Kit, Glass Shaft, 15000 mL
BP-3401-408	Retrofit Kit, Glass Shaft, 36000 mL

Retrofit Kits, Dual Bearing Shafts, Stainless Steel

BP-3601-400	Retrofit Kit, Stainless Steel Shaft, 125 mL
BP-3601-401	Retrofit Kit, Stainless Steel Shaft, 250 mL
BP-3601-402	Retrofit Kit, Stainless Steel Shaft, 500 mL
BP-3601-403	Retrofit Kit, Stainless Steel Shaft, 1000 mL
BP-3601-404	Retrofit Kit, Stainless Steel Shaft, 3000 mL
BP-3601-405	Retrofit Kit, Stainless Steel Shaft, 6000 mL
BP-3601-406	Retrofit Kit, Stainless Steel Shaft, 8000 mL
BP-3601-407	Retrofit Kit, Stainless Steel Shaft, 15000 mL
BP-3601-408	Retrofit Kit, Stainless Steel Shaft, 36000 mL

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*For all other part numbers, please call Corning Incorporated at 1.800.492.1110 in the U.S. Outside the U.S., please call your local Corning Representative.

For more technical or product information, please refer to product literature and protocols. Alternatively you may call Technical Services at 800.492.1119 or visit **www.corning.com/lifesciences.**

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