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Homogenizer

Operator's Manual

D Series: 300DS and 400DS/400DSEL



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Warranty

PRO Scientific Inc. warrants this Homogenizer to be free from defects in materials or workmanship under normal use for a period not to exceed twenty-four (24) months from receipt. This warranty does not include normal wear from use; it doesn't apply to any instrument or part which has been altered nor any instrument which has been damaged through accident, negligence, misuse, abuse, or failure to follow operating instructions, as well as the use of electric currents or circuits other than those specified on the plate affixed to the instrument.

Liability is limited to repair or replacement of the unit at PRO Scientific discretion. This warranty is in lieu of all other warranties either expressed or implied.

Claims against this warranty must be made by first contacting the PRO Scientific Service Department at 203-267-4600, out of state 800-5-THE-PRO (800-584-3776). At that time the method for remedy and service will be determined. Under no circumstances shall a unit be returned to PRO Scientific without first obtaining a Return Authorization (RA) Number. The RA number must be clearly visible on the return-shipping label. The RA number serves as identification of this unit once it arrives at the PRO Scientific Service Department.

Claims for part shortages or shipping damage in transit must be reported within ten (10) working days from receipt of unit. Such claims made after this time will not be honored. PRO Scientific reserves the right to change, alter, modify or improve any of its instruments without any obligation to make corresponding changes to any instrument previously sold or shipped. The foregoing obligations are in lieu of all other obligations and liabilities, including negligence, and all warranties, of merchantability or otherwise, expressed or implied in fact or by law, and state our entire and exclusive liability and buyer's exclusive remedy for any claim or damages in connection with the sale or furnishing of goods or parts.

Repair Policy/Instructions

NOTE: Please follow the below instructions when in need of returning a unit/item for repair to the PRO Scientific Service Department. The unit/item will not be accepted by the PRO Scientific Service Department without first following these instructions.

- 1) Call the PRO Scientific Service Department to obtain a Return Authorization Number (RA#) and additional instructions. Phone number: 203-267-4600, out of state 800-5-THE-PRO (800-584-3776)
- 2) Package unit/item in an approved shipping container.
- 3) Write the RA# on the outside of the shipping box.
- 4) Ship the unit/item to the following address:

PRO Scientific
Service Department/ Attn: RA#
99 Willenbrock Road
Oxford, CT 06478 USA

- 5) PRO Scientific will repair the unit/item in most cases within 48 hours after receiving.

Maintenance

Care and Handling:

Please unpack the apparatus carefully and check that it is not damaged. It is important that any damage that occurred in transport is detected at the time of unpacking. If you do find such damage, the carrier must be notified immediately.

Maintenance & Service:

The homogenizer should be given the care normally required for any electrical appliance. Avoid wetting or unnecessary exposure to fumes. The finish can be washed with water and soap or detergents, using a cloth or sponge. Do not allow water to get inside the unit. Allow drying before using.

Environmental Conditions:

Non-Operating Storage:

Temperature: -20 to 65 deg. C (-4 to 149 deg. F)

Humidity: 20% to 85% RH, non-condensing

Operating Conditions:

Temperature: 18 to 33 deg. C (64 to 91 deg. F)

Humidity: 20% to 85 % RH, non-condensing

Altitude: 0 to 6,562 ft. (2000 M) above sea level

Installation Category II and Pollution Degree 2 in accordance with IEC 664.

Safety

Safety Information:

- 1) Never attempt to hold the lower end of the generator while the generator is attached to the motor.
- 2) Over tightening the rotor knife onto the rotor shaft can result in breaking the shaft and/or distortion of the rotor knife.
- 3) Any servicing of the homogenizer motor unit, except brush replacement, should be performed by the PRO Scientific Service Department.
- 4) Use of any accessories or attachments other than those supplied by the manufacturer may be hazardous.
- 5) The motor unit is supplied with sealed ball bearings and requires no additional lubrication. Any additional lubrication to the motor can result in bearing and/or motor failure.
- 6) Running a generator or chamber assembly without liquid media can cause damage to the bearings.

D Series Homogenizer Introduction

Specifications:

Power (Watts) and Maximum Velocity (“Speed”) in Revolutions:
PRO300DS – 576W and 28,000 RPM
PRO400DS/PRO400DSEL – 1305W and 23,000 RPM

Electrical Requirements:

120 Volts 50/60HZ 20 Amps OR 220 Volts 50/60HZ 10 Amps

Description:

The D-Series Homogenizer is a perfect balance of power and superior performance. Combining a high watt motor and advanced technology in digital speed controls has resulted in the most reliable and durable laboratory benchtop homogenizer. Between its 3 Turn Speed Knob ability to adjust RPM in the hundreds opposed too thousands and brighter LED display provides a more user-friendly control. The D-Series Homogenizer has two different models determined by the power (watt) options, of 576W or 1305W. With a sample volume range capability from microliters to liters, it demonstrates enormous processing versatility, which is designed to homogenize, emulsify, blend, and/or mix organic and inorganic materials.

Motor Unit Contents:

The D-Series consists of the following:

1. Motor Unit with Built-in Closed Loop Speed Control
2. Motorized PRO TRAC Stand Assembly
3. Instruction Manual and Tool Kit
4. Appropriate Power Cord Set
5. Built-in Speed Display and Dual Power Light Indicators

The following accessories are supplied with the D-Series as part of the Tool Kit:

1. P/N 99-00027 - Safety Clip
2. P/N 99-00166 - 1/4” Hex Key
3. P/N 99-00187 - Screw Driver Tool

D Series Operation Instruction

This section contains information necessary to unpack and assemble the D-Series.

Unpacking:

The D-Series is shipped in a specially designed foam pack for added protection during shipping. Remove all parts from the shipping container and inspect for damage or missing parts. If any is defective or missing, contact PRO Scientific Inc. immediately.

Assembling The D-Series:

To assemble the D-Series:

1. Before inserting the power cord into the back of the stand and connecting it to the proper voltage outlet, make sure that the power switch located on the back of the stand is in the off position (push the “o” portion of the switch inward).
2. Likewise make sure that the motor switch located on the face of the housing is also in the off position (push the “o” portion of the switch inward), and that the speed control knob has been turned fully counter clockwise to the “off” position.
3. Check that the voltage noted on the back of the stand channel agrees with the available voltage. Variations of +/- 10% are permissible.
4. Insert the female end of the power cord into the power inlet module located on the back of the stand channel and the male end into the proper voltage outlet.
5. After all of the above assembly operations have been completed and the electrical connections checked, a test run of the motor unit and motorized stand can be made. Do not use any attachments at this time.

CAUTION:

Running a generator or chamber assembly without liquid media can cause damage to the bearings, unless the lower bearing of the generator has been replaced with a sealed and shielded stainless steel bearing.

6. Once again making sure that the motor switch on the front of the housing is in the “off” position, turn the power switch on the back of the stand to the “on” position. With the power switch turned “on” the power light indicator and digital display should light up. This is an indication that the main power is on.
7. Push the motor switch on the front of the housing to the “on” position the motor light indicator should light up. .
8. Turn the speed control knob clockwise and the motor will start to run and the motor speed will appear on the digital display. This knob controls a closed loop speed control, which allows for speed adjustment of 0 to the max. rpm with a speed variation of +/- 2% over the full speed range regardless of the change in viscosity of the sample being processed.

Raising And Lowering The Motor Unit:

The D-Series is supplied with the motorized PRO TRAC stand developed by PRO Scientific. This unique stand design has utilized the technology of precision positioning used in the field of automation. Combining the accuracy and ease of movement of a linear ball screw with the precision positioning used in the field of automation. Combining the accuracy and ease of movement of a linear ball screw with the precision of linear ball bushings has resulted in the industry's most advanced motor support system. Positioning of the motor unit along the length of the stand is achieved by pushing stand height switch located on the front of the housing. Hold the stand height switch in either the up or down position until the unit has reached the desired position along the stand. The motorized stand is designed so that the standard 380mm long generator cannot be driven down into the tabletop. The motor will stop with the generator mounted on the motor, the generator can be lowered down into a steam bath or similar apparatus located below the surface of the table.

Generators/Sealed Chambers Recommended:

| | |
|------------|--|
| 02-05075 | 5 mm Diameter x 75 mm Long Flat Bottom Generator |
| 02-07075 | 7 mm Diameter x 75 mm Long Saw Tooth Bottom Generator |
| 02-07095 | 7 mm Diameter x 95 mm Long Saw Tooth Bottom Generator |
| 02-07120** | 7 mm Diameter x 120 mm Long Saw Tooth Bottom Generator |
| 02-07150** | 7 mm Diameter x 150 mm Long Saw Tooth Bottom Generator |
| 02-10105 | 10 mm Diameter x 105 mm Long Saw Tooth Bottom Generator |
| 02-10115 | 10 mm Diameter x 115 mm Long Saw Tooth Bottom Generator |
| 02-10150** | 10 mm Diameter x 150 mm Long Saw Tooth Bottom Generator |
| 02-20105 | 20mm Diameter x 105 mm Long Saw Tooth Generator |
| 02-20115 | 20 mm Diameter x 115 mm Long Saw Tooth Bottom Generator |
| 02-20150** | 20 mm Diameter x 150 mm Long Saw Tooth Bottom Generator |
| 02-20200** | 20 mm Diameter x 200 mm Long Saw Tooth Bottom Generator |
| 02-20340** | 20 mm Diameter x 340 mm Long Saw Tooth Bottom Generator |
| 02-30115 | 30 mm Diameter x 115 mm Open Slotted Generator |
| 02-30150** | 30 mm Diameter x 150 mm Open Slotted Generator |
| 02-30200** | 30 mm Diameter x 200 mm Open Slotted Generator |
| 02-30340** | 30 mm Diameter x 340 mm Open Slotted Generator |
| 02-37115 | 37 mm Diameter x 115 mm Open Slotted Generator |
| 02-37150** | 37 mm Diameter x 150 mm Open Slotted Generator |
| 02-37200** | 37 mm Diameter x 200 mm Open Slotted Generator |
| 02-37340** | 37 mm Diameter x 340 mm Open Slotted Generator |
| 02-43115 | 43 mm Diameter x 115 mm Open Slotted Generator |
| 02-43150** | 43 mm Diameter x 150 mm Open Slotted Generator |
| 02-43200** | 43 mm Diameter x 200 mm Open Slotted Generator |
| 02-43340** | 43 mm Diameter x 340 mm Open Slotted Generator |
| 02-50150 | 50 mm Diameter x 150 mm Long Cryogenic Generator |
| 02-59115 | 59 mm Diameter x 115 mm Open Slotted Generator |
| 02-59150 | 59 m Diameter x 150 mm Open Slotted Generator |
| 02-59200** | 59 mm Diameter x 200 mm Open Slotted Generator |
| 02-59340** | 59 mm Diameter x 340 mm Open Slotted Generator |
| 02-70150 | 70 mm Diameter x 150 mm Long Cryogenic Generator |
| 02-30200HD | 30 mm Diameter x 200 mm Open Slotted "HD" Series Generator |
| 02-37200HD | 37 mm Diameter x 200 mm Open Slotted "HD" Series Generator |
| 02-43200HD | 43 mm Diameter x 200 mm Open Slotted "HD" Series Generator |
| 02-59200HD | 59 mm Diameter x 200 mm Open Slotted "HD" Series Generator |

****Important information for generators with a length greater than 115mm**

To ensure proper homogenization and to protect both the generator and sample, generators with a length greater than 115mm should only be used when the sample height in your tube/container comes at least half way up the generator shaft. Check the generator sizes located above for the length you are interested in and compare it to your total sample height to be homogenized to ensure that your sample height is equal to or greater than half of the generator length.

| | |
|----------------|--|
| 02-070MG-12 | Multi-Gen 7mm 316 stainless steel generators (12/pk) |
| 02-070MG-24 | Multi-Gen 7mm 316 stainless steel generators (24/pk) |
| 02-070MG7XL-12 | 12-pack of MULTI-GEN 7XL generators |

| | |
|-------------|---|
| 15-32002 | ST-2 Sealed Tube Assembly W/5 mm Generator For 1.5/2.0 ml Tubes |
| 15-32005 | ST-5 Sealed Tube Assembly W/ 5 mm Generator For 5 ml Tubes |
| 15-32010 | ST-10 Sealed Tube Assembly W/ 7 mm Generator For 18 ml Tubes |
| 15-32015 | ST-15 Sealed Tube Assembly W/ 7 mm Generator For 19 ml Tubes |
| 15-32050 | ST-50 Sealed Tube Assembly W/ 10 mm Generator For 50 ml Tubes |
| 15-32050-20 | ST-50 Sealed Tube Assembly W/ 20 mm Generator For 50 ml Tubes |
| 15-09070 | 70 ml Stainless Steel Chamber Assembly W/ 1" Diameter Blade |
| 15-09600 | 600 ml Stainless Steel Chamber Assembly W/ 2" Diameter Blade |
| 15-19473 | 473 ml Glass Chamber Assembly W/ 2" Diameter Blade |
| 15-19946 | 946 ml Glass Chamber Assembly W/ 2" Diameter Blade |
| 15-02070-10 | 70 ml Chamber Assembly W/ 10 mm Diameter Generator |
| 15-02070-20 | 70 ml Chamber Assembly W/ 20 mm Diameter Generator |
| 15-02600-20 | 600 ml Chamber Assembly W/ 20 mm Diameter Generator |
| 15-02600-30 | 600 ml Chamber Assembly W/ 30 mm Diameter Generator |
| 15-081200 | 1200 ml Chamber Assembly W/ 70 mm Diameter Cryogenic Generator |
| 15-12473-20 | 473 ml Chamber Assembly W/ 20 mm Diameter Generator |
| 15-12473-30 | 473 ml Chamber Assembly W/ 30 mm Diameter Generator |
| 15-12946-20 | 946 ml Chamber Assembly W/ 20 mm Diameter Generator |
| 15-12946-30 | 946 ml Chamber Assembly W/ 30 mm Diameter Generator |

(See Generators section for installation and usage instructions)

PRO Generators Introduction

Description:

PRO Scientific believes that as homogenizing requirements increase from hand held units to bench top laboratory units, interchangeability of generators is a necessity. All of the PRO generators will fit any of the PRO homogenizers. The ability to scale-up in size is important, therefore, all of the generators are designed with this in mind. The choice of a generator depends on the end result desired and the material being treated. One of the most important items to consider in choosing a generator is the peripheral speed, which is critical for particle size reduction. The following shows the peripheral speeds that the individual units can reach in the medium:

| | |
|--------------------------|------------------------|
| 5mm diameter generators | = 6 meters per second |
| 7mm diameter generators | = 9 meters per second |
| 10mm diameter generators | = 13 meters per second |
| 20mm diameter generators | = 26 meters per second |
| 30mm diameter generators | = 39 meters per second |
| 37mm diameter generators | = 49 meters per second |
| 43mm diameter generators | = 57 meters per second |
| 59mm diameter generators | = 78 meters per second |
| 70mm diameter generators | = 92 meters per second |

The generators all work on the same principal. The medium to be processed is pulled into the bottom of the tube by the rotor and forced out the sides through the stator slots. The stator acts as an ideal flow breaker and prevents, to a large extent, the rotation of the medium and allows the introduction of large mechanical energies in a very small space. The vortex formation known in stirring is greatly reduced but cannot be avoided altogether. In the shearing gap between the rotor stator, about 1,000 times more energy is introduced into the medium than in stirring. The particles are pulled into the center of the rotor and then forced radially outward. In this process the particles, by hitting sharp edges and along with cavitation, are reduced in size. It usually takes only a few minutes to obtain a fine particle size reduction. Longer processing times achieve only a minor improvement in particle size and reduction while increasing the temperature of the medium through the energy input.

Attaching the Generator to the Motor Unit:

- 1) All generators are fitted to the motor unit by inserting the upper end of the generator into the collar end of the motor.
- 2) Align the vertical slots in the generator with the locating pins in the motor collar by rotating the generator.
- 3) Once aligned, push the generator inward as far as possible and turn the generator counter-clockwise. The collar is spring loaded so you will feel some resistance as you push the generator inward and turn it.
- 4) Once you have turned the generator as far as it will go, release the generator and you will hear a distinct click which is the generator dropping into its locked position.
- 5) To prevent the generator from disengaging while being used, insert the safety clip between the upper collar of the generator and the bottom of the motor collar.

- 6) To disconnect the generator from the motor unit, remove the safety clip, push the generator up into the motor collar as far as possible and turn the generator clockwise $\frac{1}{2}$ turn. The generator will be pushed out of the motor collar by the force of the internal spring.

Operating Procedures:

- 1) The generator may be used with either an open chamber or within a sealed chamber assembly.
- 2) The ideal situation is when the diameter of the generator is as large as the container will allow.
- 3) Insert the generator into the medium that is to be homogenized. The depth to which the generator is inserted should normally be between $\frac{1}{2}$ to $\frac{1}{3}$ of the liquid's height measured from the bottom of the container. According to the properties of the material, it may not be necessary to insert the generator to this depth. In case of heavy sediments, the generator may have to be positioned lower, but the generator must never come in contact with the bottom of the vessel.
- 4) MID-BEARING NOTE: All generators that are 120mm in length and longer contain a mid-bearing, which is located inside the generator approximately half way up the shaft. The mid-bearing must be lubricated by the sample/liquid during processing, therefore the sample volume should cover about half the length of the generator.
- 5) Start the drive unit at the lowest possible speed and then slowly increase the speed to the desired level.
- 6) It is advisable that the generator be immersed within the container off-center. This off-center location will help minimize vortexing as well as the undesirable introduction of air into the sample.
- 7) The generators have two (2) sets of venting holes. One set is located approximately 1" from the bottom of the generator and the second set is approximately 1" below the bottom of the generator collar. The lower hole aids in keeping the lower bearing lubricated, while the top hole allows venting of any liquid that might be forced up into the tube. There is no need to avoid liquid from entering the lower set of holes.
- 8) Once you have reached the level of processing that is required, reduce the motor speed and start to slowly remove the generator from the container while the motor is still running. It is important that this be done slowly as you want to spin all medium from the generator back into the container and not outside of the container.
- 9) After spinning the medium off the generator, the motor can be turned off and the generator totally removed from the container.

Cleaning and Lubrication:

- 1) Cleaning - Immediately after you have finished working with the generator, the generator must be cleaned so that the substance residues do not stick to the rotor and stator and allow small bacterial cultures to form in undesirable places. For this purpose, the generator should be run in a solvent, which dissolves the substance residue and does not harm the components. The rotor and stator are cleaned as the solvent is pumped through the generator.
- 2) Sterilization
 - a. Chemical process - Germicidal solutions (formalin, phenol, alcohol etc.) can disinfect in most cases. However, residues of the germicide must subsequently be removed with sterilized water.
 - b. Sterilizing by humid heat - This means sterilizing with steam at a pressure of 2 bar above atmosphere and a temperature of 120°C.
 - c. Sterilizing by hot air - Hot air sterilization is normally carried out at 160 to 190°C.
 - d. Flaming - This method can be used, however, it is only effective on external surfaces.

Dismantling the Generator for Cleaning.

The following instructions are for the dismantling of only 5mm generators.

- a. Unscrew the rotor knife from the bottom of the rotor shaft. Insert the 1/4" hex key (supplied in the tool kit) into the end of the rotor shaft collar and insert the screwdriver (supplied in the tool kit) into the rotor knife and turn the hex wrench counter clockwise.
- b. Remove the rotor knife from the bottom of the generator tube and collar assembly.
- c. Draw the rotor shaft and rotor shaft collar assembly upwards out of the tube and collar assembly. The PTFE (polytetrafluoroethylene) washer can be removed from the rotor shaft.
- d. Draw the upper bearing out of the top of the tube and collar assembly. The upper bearing should be replaced when it shows signs of wear and before the rotor shaft collar starts to come in contact with the inside wall of the motor collar or starts to rub on the top of the tube and collar assembly.
- e. Remove the lower bearing from the bottom of the tube and collar assembly. The lower bearing should be replaced when worn before the rotor knife starts to rub against the side of the stator.
- f. The rotor shaft collar assembly can be removed from the rotor shaft by loosening the set screw located at the side of the rotor shaft collar using the hex wrench end of the screw driver (supplied in the tool kit).

The following instructions are for the dismantling of all other generators.

- a. Unscrew the rotor knife from the bottom of the rotor shaft. Insert the 1/4" hex key (supplied in the tool kit) into the end of the rotor shaft collar and insert the screwdriver end, which is a hex key tool, (supplied in the tool kit) into the rotor knife and turn the hex wrench counter clockwise.
- b. Remove the rotor knife from the bottom of the generator tube and collar assembly

- c. Remove the rotor shaft collar assembly by loosening the setscrew located in the side of the rotor shaft collar from the rotor shaft using the hex wrench end of the screwdriver tool (Do not unscrew the setscrew from within the rotor shaft collar assembly).
- d. Remove the PTFE washer from the rotor shaft. Draw the rotor shaft downwards out of the tube and collar assembly. (If rotor shaft does not slide out, press down on the rotor shaft from the top of the generator tube and collar assembly using the hex wrench end of the screwdriver tool).
- e. Remove the lower bearing from the end of the tube and collar assembly using the screwdriver. The screwdriver should be inserted high enough to reach the inner side of the lower bearing. Put the flat side of the screwdriver against the lower bearing, and then pull the handle of the screwdriver against the saw-teeth or open-slotted end of the generator probe. The lower bearing should come out. The lower bearing should be replaced when it shows signs of wear and before the rotor shaft collar starts to come in contact with the inside wall of the motor collar or starts to rub on the top of the tube and collar assembly.
- f. Cleaning – The generator is rinsed in a cleaning material or solvent. The solvent must not attack stainless steel or PTFE. For a thorough cleaning the generator must be dismantled, as the medium also wets the inner wall of the tube.
- g. Sterilization – After cleaning, the sterilization methods previously mentioned are suitable for sterilizing these generators.

Assembly of the Generator:

The following instructions are for the assembly of only 5mm generators.

- 1) Insert the lower bearing into the bottom of the tube and collar assembly. Take the rotor knife and place it into the bottom of the tube and collar assembly and push the lower bearing into its proper location. The proper location is when the end of the rotor knife is flush with the bottom of the tube and collar assembly.
- 2) Insert the upper bearing into the top of the tube and collar assembly. Proper positioning of the upper bearing is when the flange of the bearing is firmly seated against the top of the tube and collar assembly.
- 3) Attach the rotor shaft collar to the end of the rotor shaft. Make sure that the setscrew in the rotor shaft collar lines up with the flat on the end of the rotor shaft. The rotor shaft collar should be located as close to the end of the rotor shaft as possible. Slide the PTFE washer up the rotor shaft until it contacts the rotor shaft collar.
- 4) Insert the rotor shaft with the rotor shaft collar and PTFE washer attached into the upper end of the tube and collar assembly.
- 5) The rotor shaft should rotate freely within the tube and collar assembly. If the rotor shaft does not rotate freely, remove the rotor shaft from the tube and collar assembly and inspect both the upper and lower bearings for any possible damage. Replace any damaged bearings.
- 6) Insert the rotor knife into the end of the tube and collar assembly and rotate the knife clockwise while holding the rotor shaft collar.
- 7) Once the rotor knife is threaded onto the end of the rotor shaft, insert the 1/4" hex wrench into the end of the rotor shaft collar and the screwdriver into the end of the rotor knife and lightly tighten.

- 8) With the rotor knife attached, place the generator with the blade end downward onto a flat surface. Loosen the setscrew located on the side of the rotor shaft collar. Push the rotor shaft collar downward until the PTFE washer is in contact with both the bottom of the rotor shaft collar and the top of the upper bearing. Tighten the set screw and check that the generator rotates freely.

The following instructions are for the assembly of all other generators.

- 1) Attach the rotor knife to the rotor shaft by screwing it together until tight (hand tighten). Slide the lower bearing onto the rotor shaft until it reaches the rotor knife.
- 2) Insert the Rotor Shaft into the end of the tube and collar assembly. Then push the rotor knife up into the end of the tube and collar assembly until it cannot go any further. This will put lower bearing into place. The rotor shaft should be seen at the top of the tube and collar assembly.
- 3) While pushing against the rotor knife, put the rotor collar assembly onto the rotor shaft.
- 4) While holding the rotor knife, locate the setscrew on the side of the rotor shaft collar and locate the flat end of the rotor shaft to be facing each other. Once locations are lined up with one another, tighten the setscrew against the flat end of the rotor shaft using the hex wrench end of the screwdriver tool (supplied in the tool kit).

PRO Multi-Gen Introduction

PRO Multi-Gen Adapters And Generators:

The Multi-Gen generators and adapters have been designed to allow continuous processing without having to clean or decontaminate the generator between samples. Constructed with 316 stainless steel and PTFE, the Multi-Gen generator can be autoclaved assembled or in parts. The Multi-Gen adapter allows the Multi-Gen generators to be attached to and used with any PRO homogenizer motor unit.



Attachment of the Adapter to the Drive Motor:

- 1) Remove the adapter from the shipping package.
- 2) Align the grooves in the side of the adapter's upper collar with the two (2) pins in the bottom of the motor collar.
- 3) Push the adapter into the motor collar.
- 4) Once inserted as far as it will go, turn the adapter counter-clockwise until you feel the adapter lock into place. This should be approximately a 1/2 turn.
- 5) Once the adapter is attached to the motor collar, it is important that the safety clip supplied with the adapter be inserted between the bottom of the motor collar and the shoulder of the adapter. Proper insertion of the safety clip will prevent the adapter from disengaging from the motor collar when ejecting the used generator.

Attachment of the Multi-Gen Generator to the Adapter

- 1) Remove one generator from the box.
- 2) Push the bottom sleeve on the adapter upward.
- 3) With the sleeve pulled back, insert the grooved end of the generator into the bottom of the adapter.
- 4) Once the generator has been inserted as far as possible into the bottom of the adapter, the bottom sleeve of the adapter can be released. Releasing the bottom sleeve will lock the generator in place. Pulling gently on the generator will ensure that the generator is securely in place.

Removal of the Multi-Gen Generator from the Adapter

- 1) With the motor in an upward position, (generator pointing downward), slide the bottom of the adapter upward. Sliding the bottom sleeve of the adapter upward will allow the generator to drop out of the adapter.

Please refer to the Multi-Gen generators instructions that were included with your Multi-Gen Generator Pack for further instructions on disassembly, assembly and cleaning.

PRO Sealed Chamber Assembly Introduction

Sealed Chamber Assembly with a Blade:

The sealed chambers are by far the industry's safest method of homogenizing with either a blade or a rotor stator generator. The unique design of the sealed chamber assembly does not allow the user to operate the system with the blade exposed. The blade assembly can not be engaged to the drive motor unless the chamber is attached. In addition to preventing the operator from being exposed to a rotating blade, the sealed chamber assembly protects the operator from hazardous aerosols generated during homogenizing.

Completing the Chamber Assembly With a Blade

All chamber assemblies using a blade are completed as follows:

- 1) Screw the rotor shaft assembly into the cover plug. Tighten snugly using the multi-wrench (supplied in the tool kit).
- 2) With the sharpened side of the blade up, mount the blade on the rotor shaft engaging the tabs in the knife collar with the cutout in the center of the blade and secure with the acorn nut.

WARNING: The knife blades are surgically sharpened and should be handled carefully to avoid injury.

- 3) Tighten snugly with the multi wrench, while holding the rotor shaft steady with the 1/4"hex wrench.
- 4) Insert the rotor shaft assembly and cover plug with the blade attached into the chamber.
- 5) Screw the chamber cover onto the chamber. Note that the threads on the chamber and cover are left hand threads and are screwed together by turning the cover counter clockwise. These two parts should be tightened securely. There is no way in which the blade can be attached to the motor unit without the chamber being attached. This is to ensure that the operator is never exposed to a rotating blade.
- 6) Attach the chamber assembly to the motor as follows:
 - a. Insert the upper end of the chamber assembly into the motor collar.
 - b. Align the slots in the top of the chamber assembly with the locating pins in the motor collar by rotating the chamber assembly as you insert it into the collar.
 - c. Once aligned, push the chamber assembly inward as far as possible and turn the chamber assembly counter-clockwise 1/2 turn. The collar is spring loaded so you will feel some resistance as you push the chamber assembly inward and turn it.
 - d. Once you have turned the chamber assembly as far as it will go, release the chamber assembly and you will hear a distinct click which is the chamber assembly dropping into its locked position.
 - e. Insert the safety clip between the top of the chamber lid and the bottom of the motor collar.
 - f. Lower the entire motor unit on the stand until the bottom of the chamber assembly is resting on the tabletop, the bottom of the cooling/heating vessel or the top of a height block.

WARNING: Even when the homogenizer uses the sealed chamber assemblies, the chamber assembly should still be operated only with the bottom of the chamber assembly resting on the tabletop, the bottom of the cooling/heating vessel or the top of a height block.

- g. To disconnect the chamber assembly from the motor unit, remove the safety clip, push the chamber assembly upward into the motor collar as far as necessary to allow you to turn the chamber assembly clockwise 1/2 turn. The internal spring will push the assembly downward and out of the motor collar.

Using the Chamber Assembly with a Blade:

The various chamber assemblies (stainless steel, glass and plastic) can be used for homogenization of materials in the liquid/liquid, liquid/solid, and solid/solid states. Homogenization and mixing will normally be completed within 30 seconds to one minute. At revolutions higher than 8,000 rpm the time of mixing should be limited to three minutes with dry mixtures and ten minutes for liquids. To homogenize solid materials it is advisable to chop up pieces larger than 1.0 cm in diameter before putting them into the chamber.

Operation Procedures:

Assemble the cover/cover plug and rotor shaft assembly. Load the material to be processed into the chamber. It is recommended that the chamber be filled only to approximately 75% of its total volume. Attach the filled chamber to the cover and cover plug/rotor shaft assembly and attach it to the motor.

WARNING: The homogenizer should only be operated with the bottom of the chamber assembly resting on the tabletop, the bottom of the cooling or heating vessel or the top of a height block.

Rotate the speed control dial until the desired speed is reached. When the desired time period has elapsed, turn the "ON/OFF" switch position. Remove the chamber assembly from the motor unit before opening the chamber assembly.

Operation Techniques:

To use the homogenizer effectively, the following techniques are recommended:

WARNING: When it is necessary to use volatile, flammable, toxic, pathogenic, radioactive or other hazardous materials, standard laboratory precautions should be followed, such as venting, operating in a fume hood, etc. The homogenizer is not made of an explosion-proof construction.

- 1) Cooling - At revolutions above 5,000 rpm, relatively high temperatures are generated. Therefore, the chamber should be cooled whenever operating at speeds

- above 5,000 rpm by immersing the chamber in an ice bath or similar cooling vessel.
- 2) Ball Milling - At revolutions below 5,000 rpm, particles may be broken down by using hard materials, such as glass beads. The homogenizer will act as a “ball mill” agitating the chamber while the hard materials do the work. Since sharpness is not essential, a dull knife blade should be used.
 - 3) Homogenizing - For more complete homogenization of some materials, it is helpful to rock the motor unit slightly to churn up the specimen within the chamber.
 - 4) Adding a grinding medium - To attain the desired effect (cell breakdown), a combination of procedures may be necessary. First, homogenize the specimen in solution using speed and a sharp knife blade. Then change the knife blade, add a grinding medium and run the homogenizer at maximum speed of 5,000 rpm for ten to fifteen minutes.

Cleaning and Lubrication:

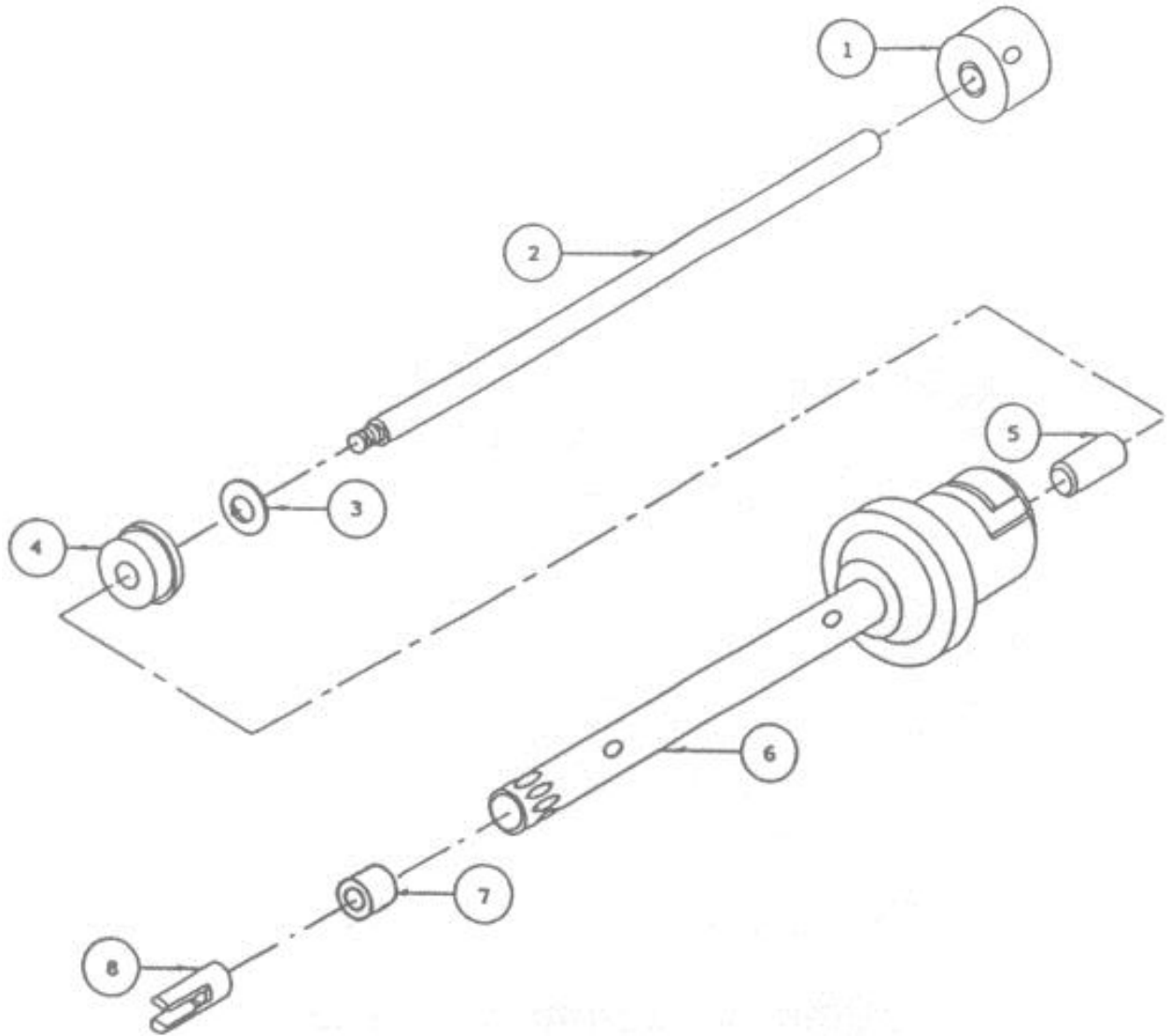
To prevent contamination of specimens, always clean the chamber assembly as soon as possible after use. Some acceptable methods of cleaning are as follows:

- 1) Cleaning - Run the chamber assembly with a solvent added which will dissolve the substance residue and not harm components. The rotor shaft and blade as well as the chamber are cleaned as the solvent is mixed within the chamber assembly.
- 2) Sterilization - It is recommended that the chamber assembly be disassembled prior to sterilization. Disassemble the chamber assembly by reversing the assembly procedure. All parts of the chamber assembly are autoclavable.
 - a. Chemical processes - Germicidal solutions (formalin, phenol, alcohol, etc.) can disinfect in most cases. However, residues of the germicide must subsequently be removed with sterilized water.
 - b. Sterilizing by humid heat - This means sterilizing with steam at a pressure of 2 bar above atmosphere and at a temperature of 120°C.
 - c. Sterilizing by hot air - Hot air sterilization is normally carried out at 160 to 190°C.
 - d. Flaming - This method can be used, however, it is only effective on external surfaces.

PRO Generator Index: Drawings And Part List

5mm, 7mm, and 10mm Generators:

Use the drawing below to assist with the generators listed.

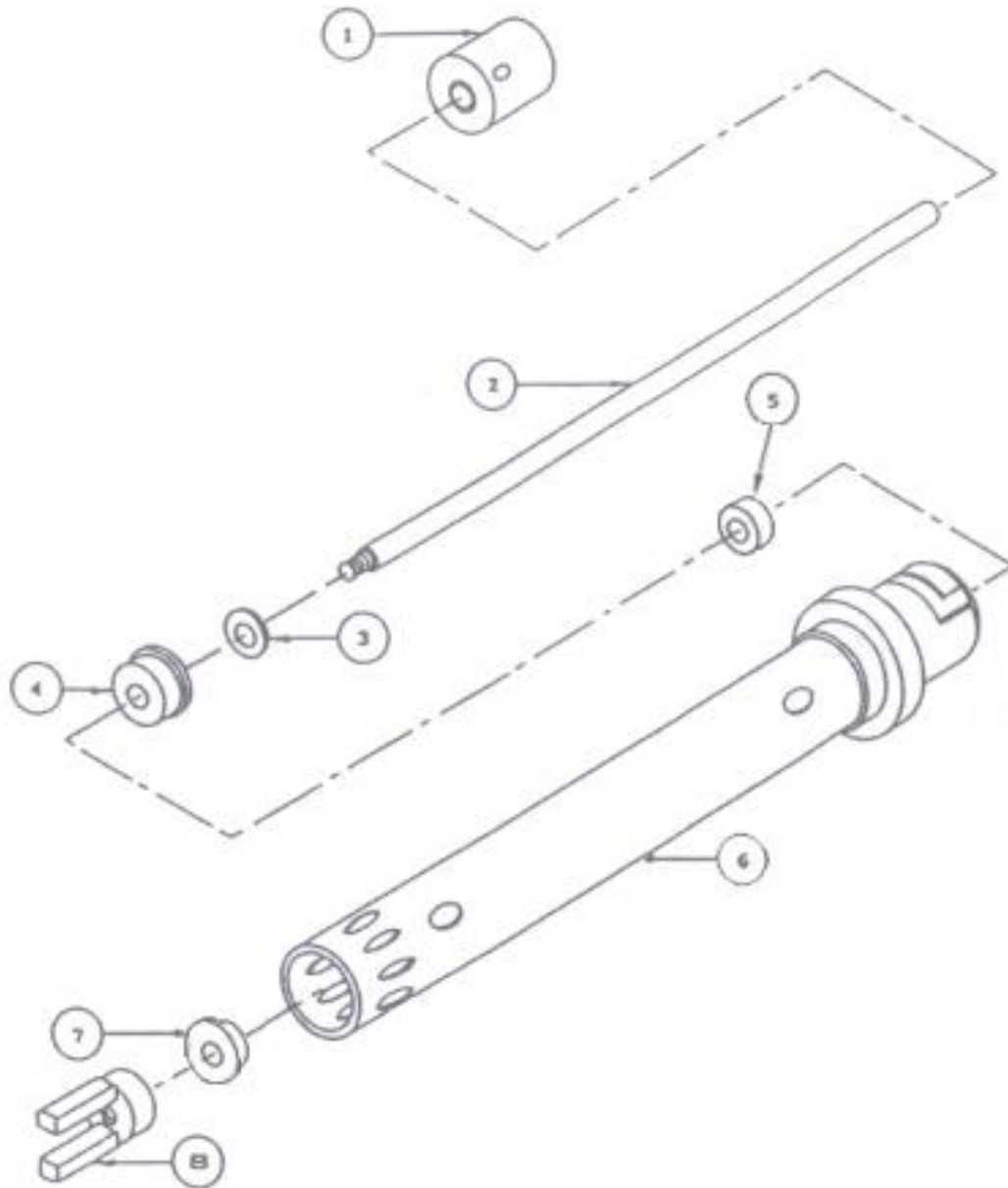


| Part Number | Size mmXmm | Rotor Collar (1) | Rotor Shaft (2) | PTFE Washer (3) | Upper Bearing (4) | Middle Bearing (5) | Tube and Collar (6) | Lower Bearing (7) | Rotor Knife (8) |
|-------------|------------|---------------------|--------------------|--------------------|----------------------|-----------------------|------------------------|----------------------|--------------------|
| 02-05075 | 5 X 75 | 07-00150 | 05-05075 | 99-03302 | 03-10001 | N/A | 08-05075 | 03-21002 | 04-05150 |
| 02-05150 | 5 X 150 | 07-00150 | 05-05150 | 99-03302 | 03-10001 | 03-21102 | 08-05150 | 03-21002 | 04-05150 |
| 02-07075 | 7 X 75 | 07-00150 | 05-07075 | 99-03302 | 03-10001 | N/A | 08-07075 | 03-21003 | 04-07150 |
| 02-07095 | 7 X 95 | 07-00150 | 05-07095 | 99-03302 | 03-10001 | N/A | 08-07095 | 03-21003 | 04-07150 |
| 02-07120 | 7 X 120 | 07-00150 | 05-07120 | 99-03302 | 03-10001 | 03-21103 | 08-07120 | 03-21003 | 04-07150 |
| 02-07150 | 7 X 150 | 07-00150 | 05-07150 | 99-03302 | 03-10001 | 03-21103 | 08-07150 | 03-21003 | 04-07150 |
| 02-10105 | 10 X 105 | 07-00150 | 05-10105 | 99-03302 | 03-10001 | N/A | 08-10105 | 03-21004 | 04-10150 |
| 02-10115 | 10 X 115 | 07-00150 | 05-10115 | 99-03302 | 03-10001 | N/A | 08-10115 | 03-21004 | 04-10150 |
| 02-10150 | 10 X 150 | 07-00150 | 05-10150 | 99-03302 | 03-10001 | 03-21104 | 08-10150 | 03-21004 | 04-10150 |

(10mm X 150mm)

20mm Generators:

Use the drawing below to assist with the generators listed.

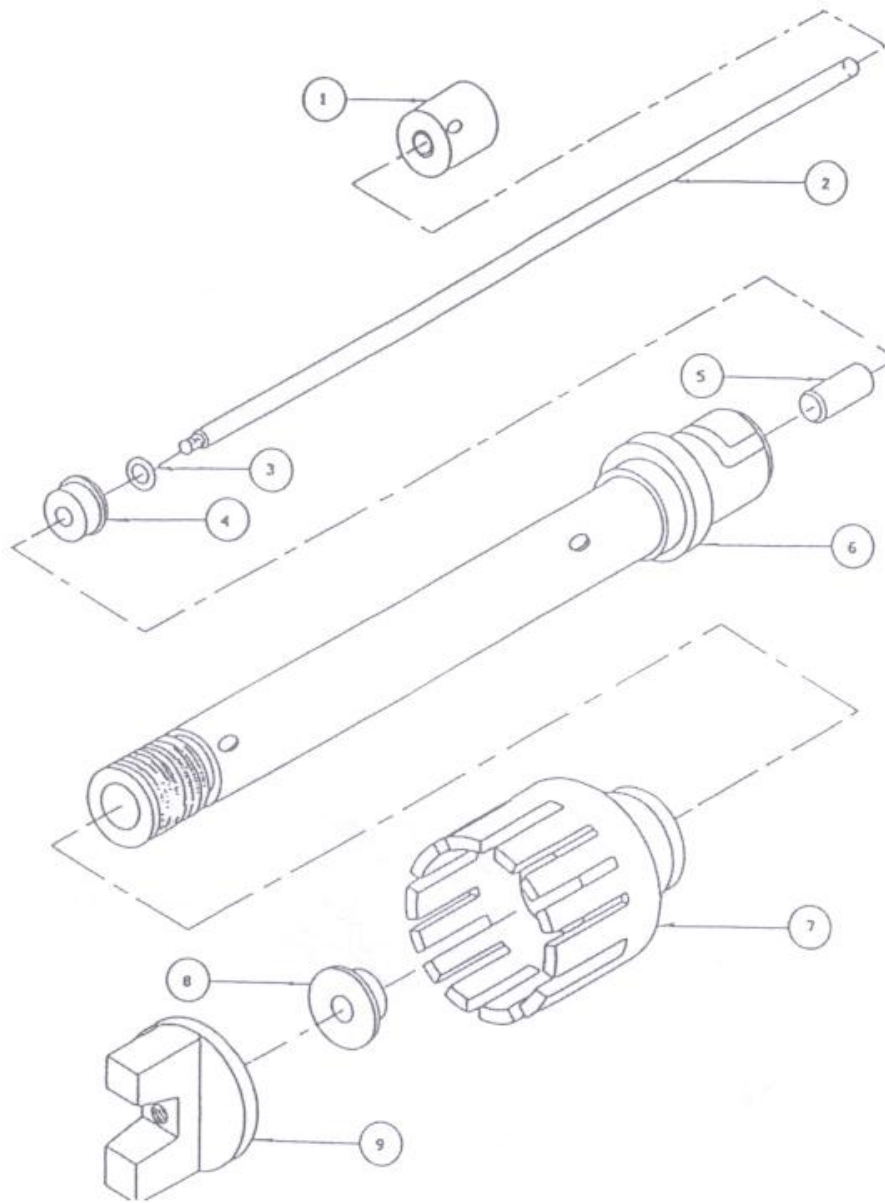


| Part Number | Size mmXmm | Rotor Collar (1) | Rotor Shaft (2) | PTFE Washer (3) | Upper Bearing (4) | Middle Bearing (5) | Tube and Collar (6) | Lower Bearing (7) | Rotor Knife (8) |
|-------------|------------|---------------------|--------------------|--------------------|----------------------|-----------------------|------------------------|----------------------|--------------------|
| 02-20105 | 20 X 105 | 07-00150 | 05-20105 | 99-03302 | 03-10001 | N/A | 08-20105 | 03-11005 | 04-20150 |
| 02-20115 | 20 X 115 | 07-00150 | 05-20115 | 99-03302 | 03-10001 | N/A | 08-20115 | 03-11005 | 04-20150 |
| 02-20150 | 20 X 150 | 07-00150 | 05-20150 | 99-03302 | 03-10001 | 03-21104 | 08-20150 | 03-11005 | 04-20150 |
| 02-20200 | 20 X 200 | 07-00150 | 05-20200 | 99-03302 | 03-10001 | 03-21104 | 08-20200 | 03-11005 | 04-20150 |
| 02-20340 | 20 X 340 | 07-00150 | 05-20340 | 99-03302 | 03-10001 | 03-21104 | 08-20340 | 03-11005 | 04-20150 |

(20mm X 200mm)

30mm, 37mm, 43mm & 59mm Generators:

Use the drawing below to assist with the generators listed.



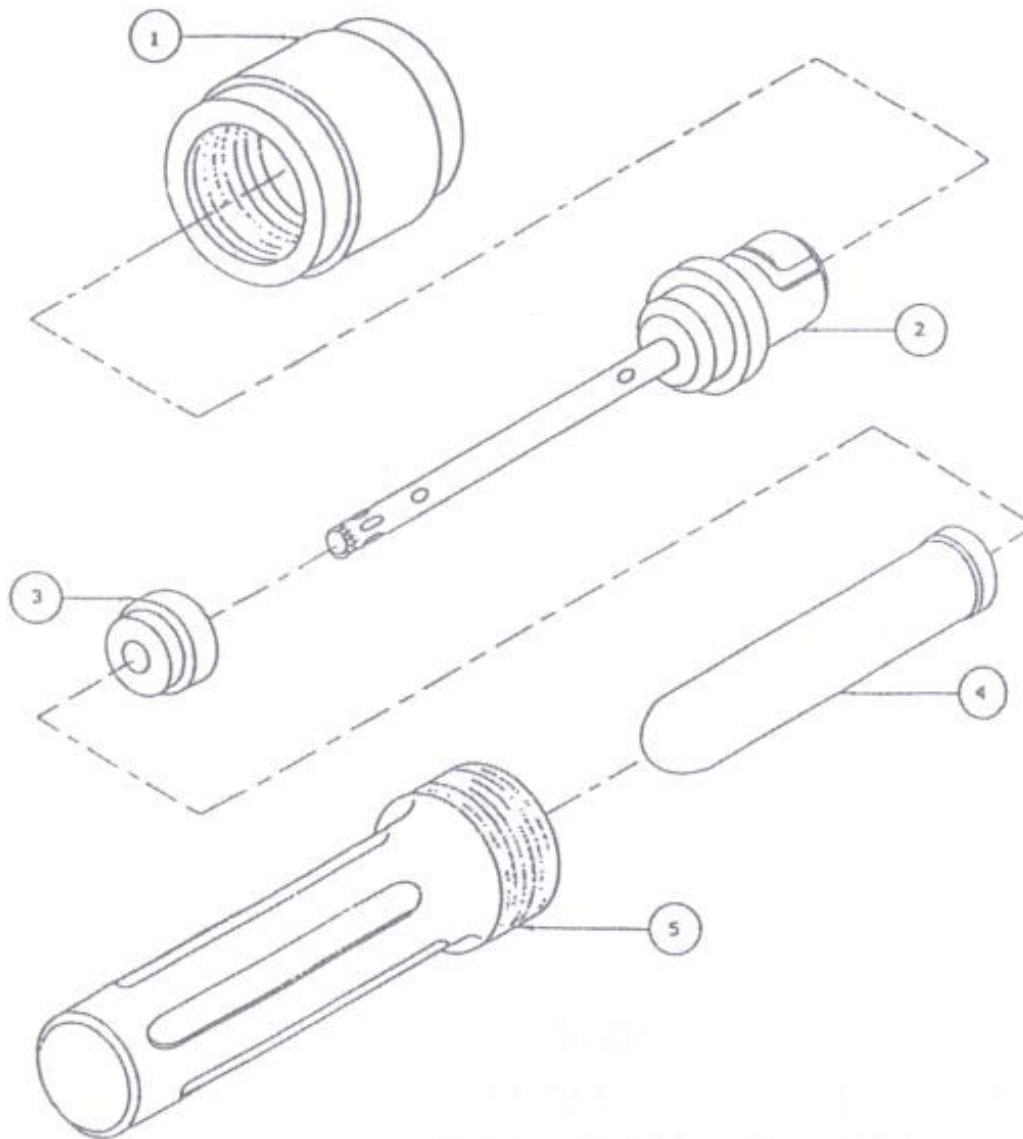
(30mm X 200mm)

| Part Number | Size mmXmm | Rotor Collar (1) | Rotor Shaft (2) | PTFE Washer (3) | Upper Bearing (4) | Middle Bearing (5) | Tube and Collar (6) | Rotor Head (7) | Lower Bearing (8) | Rotor Knife (9) |
|-------------|------------|------------------|-----------------|-----------------|-------------------|--------------------|---------------------|----------------|-------------------|-----------------|
| 02-30115 | 30 X 115 | 07-00150 | 05-20115 | 99-03302 | 03-10001 | N/A | 08-01115 | 16-30150 | 03-11037 | 04-30150 |
| 02-30150 | 30 X 150 | 07-00150 | 05-20150 | 99-03302 | 03-10001 | 03-21104 | 08-01150 | 16-30150 | 03-11037 | 04-30150 |
| 02-30200 | 30 X 200 | 07-00150 | 05-20200 | 99-03302 | 03-10001 | 03-21104 | 08-01200 | 16-30150 | 03-11037 | 04-30150 |
| 02-30340 | 30 X 340 | 07-00150 | 05-20340 | 99-03302 | 03-10001 | 03-21104 | 08-01340 | 16-30150 | 03-11037 | 04-30150 |
| 02-37115 | 37 X 115 | 07-00150 | 05-20115 | 99-03302 | 03-10001 | N/A | 08-01115 | 16-37150 | 03-11037 | 04-37150 |
| 02-37150 | 37 x 150 | 07-00150 | 05-20150 | 99-03302 | 03-10001 | 03-21104 | 08-01150 | 16-37150 | 03-11037 | 04-37150 |
| 02-37200 | 37 x 200 | 07-00150 | 05-20200 | 99-03302 | 03-10001 | 03-21104 | 08-01200 | 16-37150 | 03-11037 | 04-37150 |
| 02-37340 | 37 x 340 | 07-00150 | 05-20340 | 99-03302 | 03-10001 | 03-21104 | 08-01340 | 16-37150 | 03-11037 | 04-37150 |
| 02-43115 | 43 x 115 | 07-00150 | 05-20115 | 99-03302 | 03-10001 | N/A | 08-01115 | 16-43150 | 03-11037 | 04-43150 |
| 02-43150 | 43 x 150 | 07-00150 | 05-20150 | 99-03302 | 03-10001 | 03-21104 | 08-01150 | 16-43150 | 03-11037 | 04-43150 |
| 02-43200 | 43 x 200 | 07-00150 | 05-20200 | 99-03302 | 03-10001 | 03-21104 | 08-01200 | 16-43150 | 03-11037 | 04-43150 |
| 02-43340 | 43 x 340 | 07-00150 | 05-20340 | 99-03302 | 03-10001 | 03-21104 | 08-01340 | 16-43150 | 03-11037 | 04-43150 |
| 02-59115 | 59 x 115 | 07-00150 | 05-20115 | 99-03302 | 03-10001 | N/A | 08-01115 | 16-59150 | 03-11037 | 04-59150 |
| 02-59150 | 59 x 150 | 07-00150 | 05-20150 | 99-03302 | 03-10001 | 03-21104 | 08-01150 | 16-59150 | 03-11037 | 04-59150 |
| 02-59200 | 59 x 200 | 07-00150 | 05-20200 | 99-03302 | 03-10001 | 03-21104 | 08-01200 | 16-59150 | 03-11037 | 04-59150 |
| 02-59340 | 59 x 340 | 07-00150 | 05-20340 | 99-03302 | 03-10001 | 03-21104 | 08-01340 | 16-59150 | 03-11037 | 04-59150 |

PRO Sealed Chamber Index: Drawings and Part list

ST Series:

Use the drawing below to assist with the sealed chambers listed.

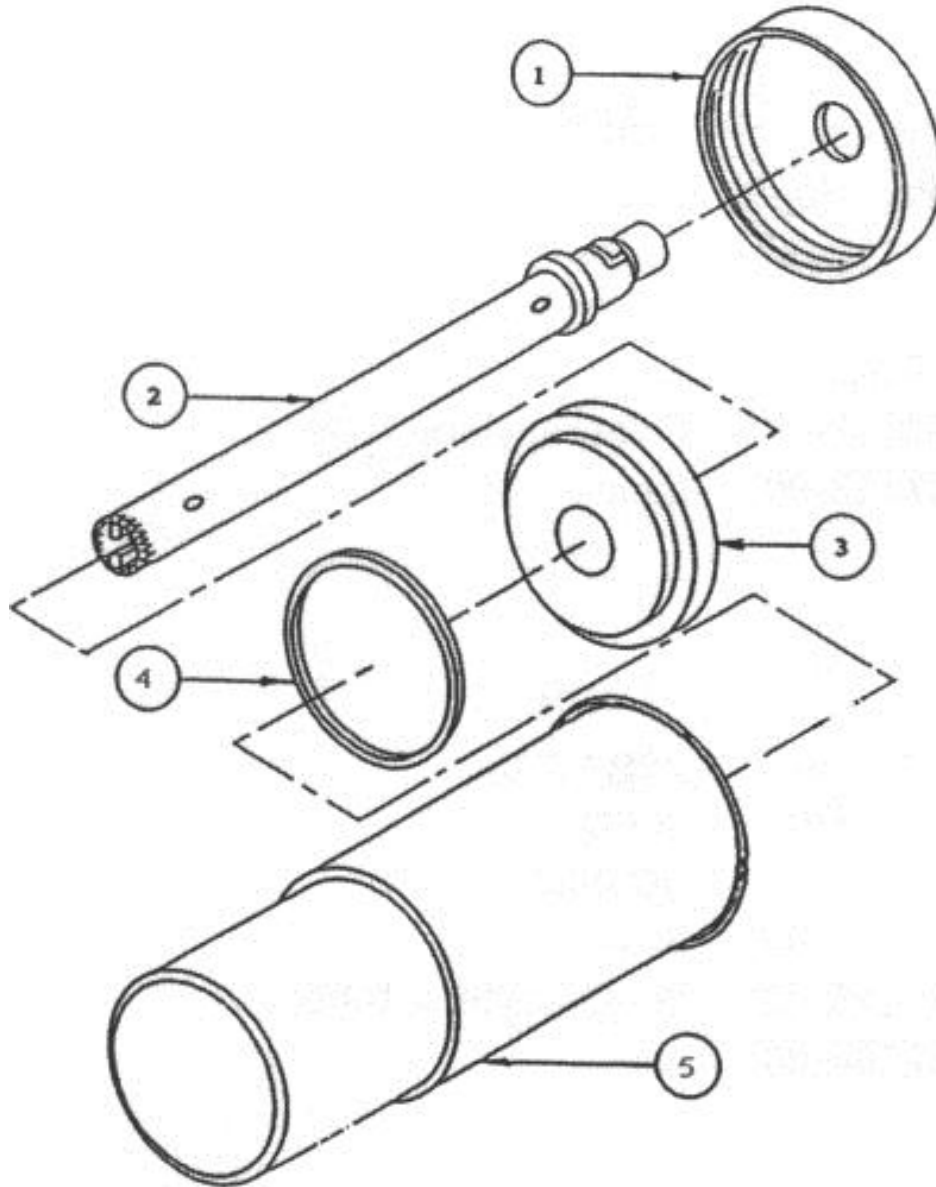


(5ml, 16ml, 19ml, and 50ml)

| Part Number | Size ml | Vol. ml | Cover (1) | Shaft Assembly (2) | Polypropylene tube (3) | Cage (4) | Seal (5) |
|--------------------|----------------|----------------|----------------------|-------------------------------|-----------------------------------|---------------------|---------------------|
| 15-32005 | 5 | 0.2-3 | 14-01150 | 02-05075 | 11-03050 | 11-02053 | 14-21051 |
| 15-32010 | 16 | 0.5-11 | 14-01150 | 02-07095 | 11-03100 | 11-02103 | 14-21151 |
| 15-32015 | 19 | 0.5-13 | 14-01150 | 02-07120 | 11-03150 | 11-02153 | 14-21151 |
| 15-32050 | 50 | 5-40 | 14-01500 | 02-10105 | 11-03500 | 11-02503 | 14-21501 |

Stainless Steel:

Use the drawing below to assist with the sealed chambers listed

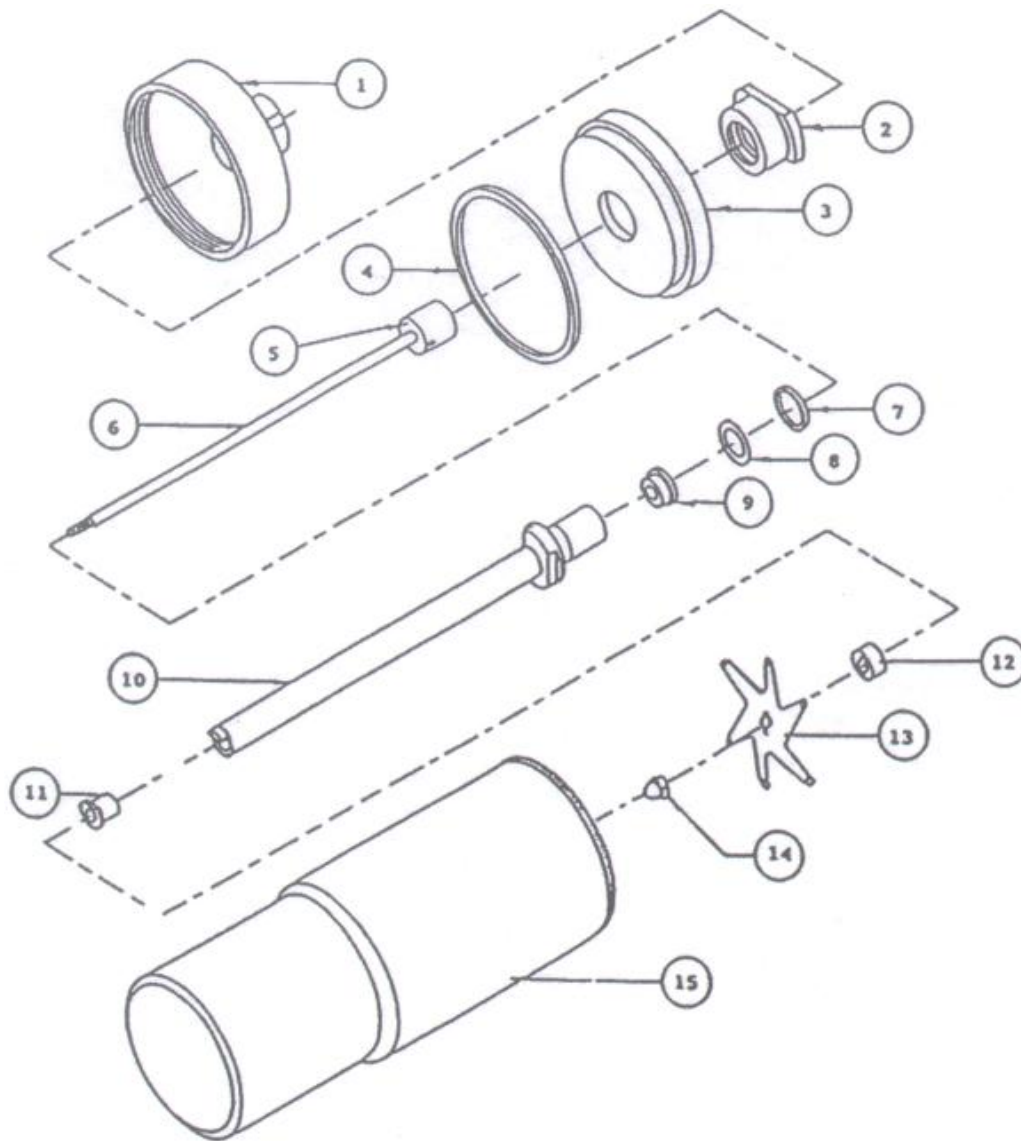


(600 ml)

| Part Number | Size ml | Vol. ml | Cover (1) | Shaft Assembly (2) | Plug (3) | Gasket (4) | S.S. Chamber (5) |
|-------------|---------|---------|--------------|-----------------------|-------------|---------------|---------------------|
| 15-02070-10 | 70 | 10-65 | 14-01500 | 02-10115 | 14-11701 | 99-00022 | 11-00700 |
| 15-02600-20 | 600 | 40-500 | 14-01600 | 02-20150 | 14-11601 | 99-00021 | 11-00600 |
| 15-02600-30 | 600 | 40-500 | 14-01600 | 02-30150 | 14-11601 | 99-00021 | 11-00600 |
| 15-081200 | 1.2L | 100-1L | 14-33120 | 02-70150 | N/A | N/A | 11-00120 |

Stainless Steel with Blade:

Use the drawing below to assist with the sealed chambers listed.

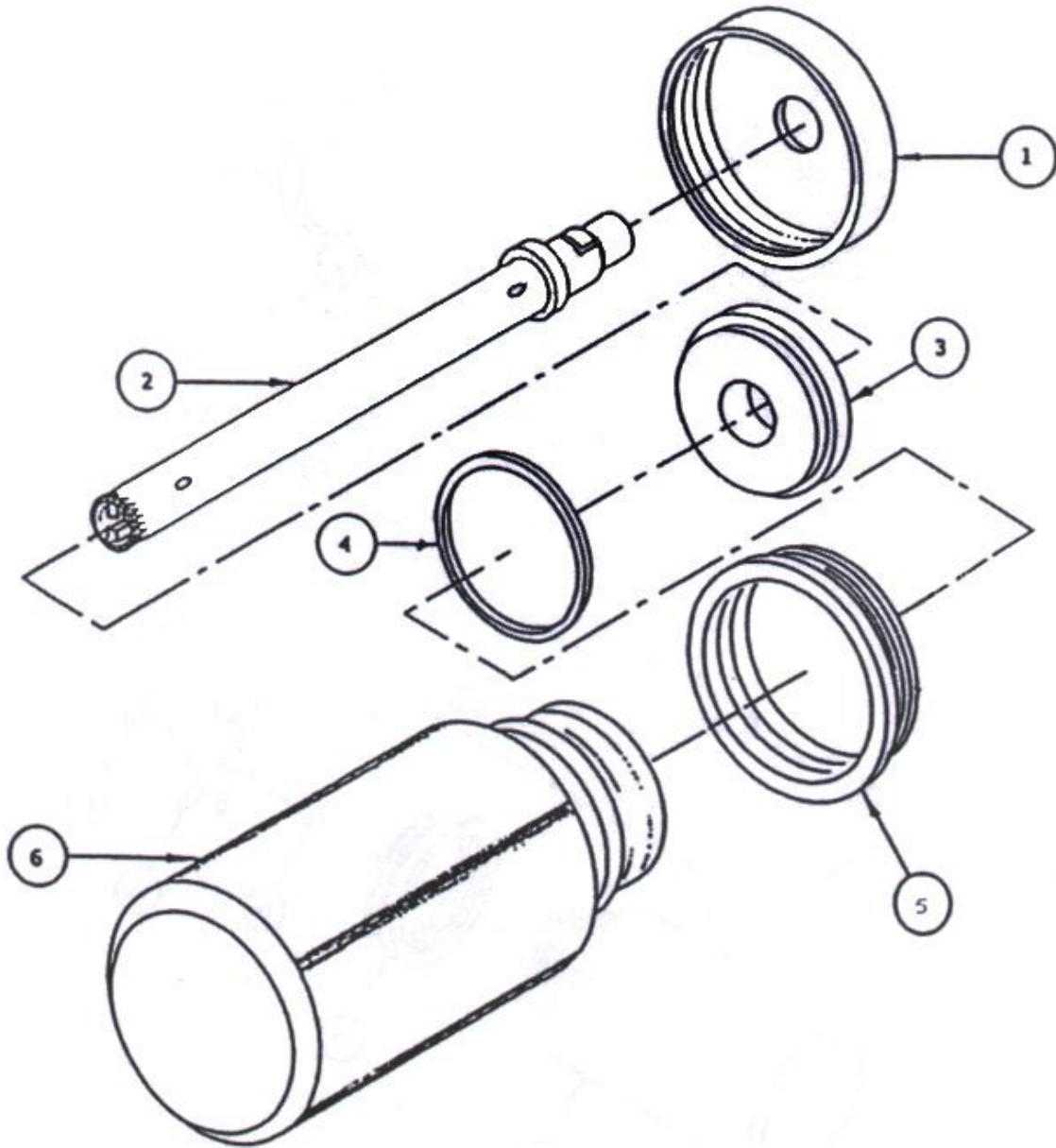


(600ml)

| Part Number | Size ml | Vol. ml | Cover | Insert | Plug | Gasket | Rotor Collar | Rotor Shaft | "O" Ring | Washer |
|-------------|---------|---------|---------------|-----------------|---------------|--------------|--------------|-------------|--------------|----------|
| | | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 15-09070 | 70 | 10-65 | 14-02700 | N/A | 14-02701 | 99-00022 | 07-00150 | 05-02115 | 99-05016 | 99-03302 |
| 15-09600 | 600 | 40-500 | 14-02600 | 14-00003 | 14-12601 | 99-00021 | 07-00150 | 05-02150 | 99-05016 | 99-03302 |
| | | | Upper Bearing | Tube and Collar | Rulon Bearing | Blade Collar | Rotor Blade | Acorn Nut | S.S. Chamber | |
| | | | (9) | (10) | (11) | (12) | (13) | (14) | (15) | |
| | | | 03-10001 | 08-02115 | 03-12187 | 07-00003 | 04-02001 | 99-22049 | 11-00700 | |
| | | | 03-10001 | 08-02150 | 03-12187 | 07-00003 | 04-02002 | 99-22049 | 11-00600 | |

Glass:

Use the drawing below to assist with the sealed chambers listed.

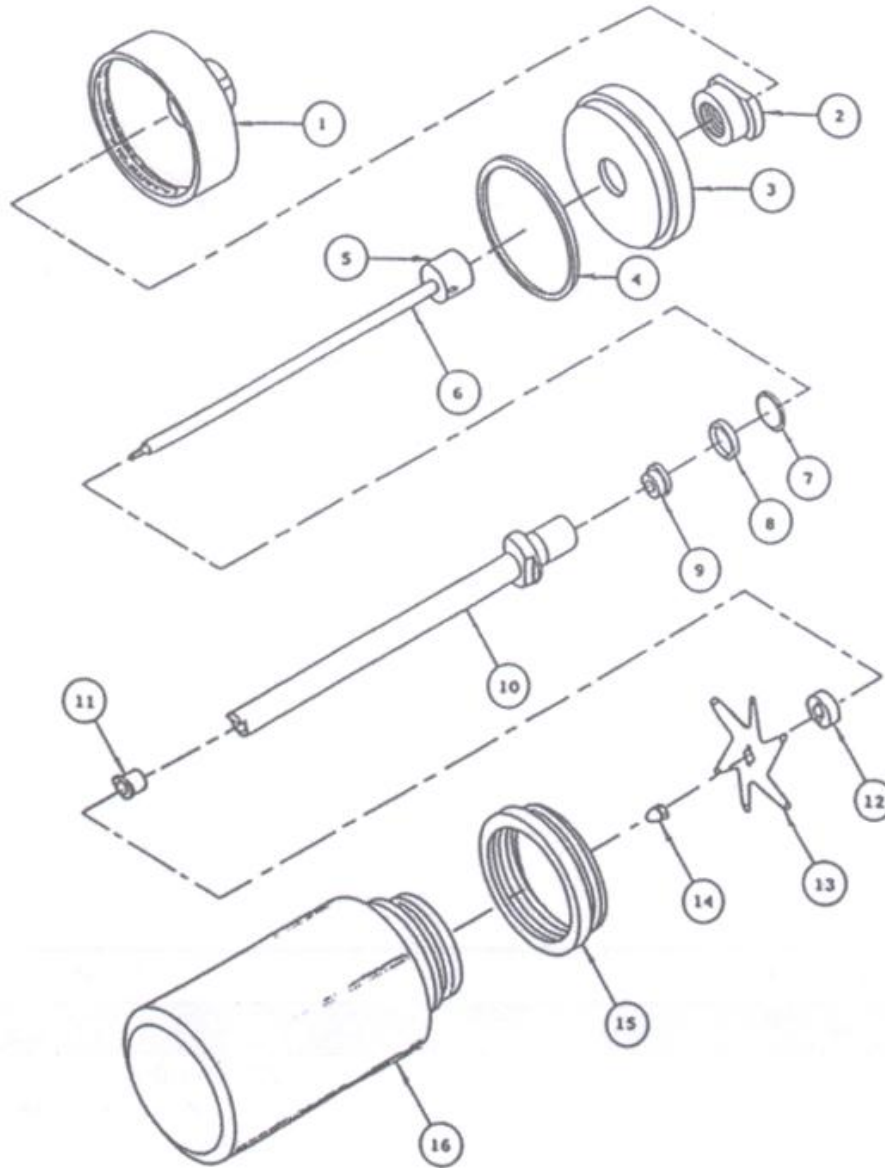


| Part Number | Size ml | Vol. ml | Cover (1) | Shaft Assembly (2) | Plug (3) | Gasket (4) | Adapter (5) | Glass Chamber (6) |
|-------------|---------|---------|--------------|-----------------------|-------------|---------------|----------------|----------------------|
| 15-12473-20 | 473 | 30-450 | 14-01600 | 02-20115 | 14-11001 | 99-00021 | 14-00002 | 11-01470 |
| 15-12473-30 | 473 | 30-450 | 14-01600 | 02-30115 | 14-11001 | 99-00021 | 14-00002 | 11-01470 |
| 15-12946-20 | 946 | 50-800 | 14-01600 | 02-20150 | 14-11001 | 99-00021 | 14-00002 | 11-01940 |
| 15-12946-30 | 946 | 50-800 | 14-01600 | 02-30150 | 14-11001 | 99-00021 | 14-00002 | 11-01940 |

(473ml and 946ml)

Glass Blade:

Use the drawing below to assist with the sealed chambers listed.



(473ml and 946ml)

| Part Number | Size ml | Vol. ml | Cover | Insert | Plug | Gasket | Rotor Collar | Rotor Shaft | "O" Ring | Washer |
|-------------|---------|---------|---------------|-----------------|---------------|--------------|--------------|-------------|----------|---------------|
| | | | (1) | (2) | (3) | (4) | (5)- | (6)- | (7) | (8) |
| 15-19473 | 473 | 50-450 | 14-02600 | 14-00003 | 14-12001 | 99-00021 | 07-00150 | 05-02150 | 99-05016 | 99-03302 |
| 15-19946 | 946 | 100-800 | 14-02600 | 14-00003 | 14-12001 | 99-00021 | 07-00150 | 05-02150 | 99-05016 | 99-03302 |
| | | | Upper Bearing | Tube and Collar | Rulon Bearing | Blade Collar | Rotor Blade | Acorn Nut | Adapter | Glass Chamber |
| | | | (9) | (10)- | (11) | (12) | (13) | (14) | (15) | (16) |
| | | | 03-10001 | 08-02150 | 03-12187 | 07-00003 | 04-02002 | 99-22049 | 14-00002 | 11-01470 |
| | | | 03-10001 | 08-02150 | 03-12187 | 07-00003 | 04-02002 | 99-22049 | 14-00002 | 11-01940 |