



Thermo Scientific

Sorvall CW2 Plus

Instruction Manual

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Introduction

The CW2 Plus is a benchtop cell washer that automatically performs the washing phase of the anti-globulin procedure in tests using up to six drops of blood sample.

The unit will accommodate either twelve 12 x 75 mm tubes, or twelve 10 x 75 mm tubes. It is registered as a device in accordance with FDA regulations governing the distribution and use of such products.

The unit incorporates a power entry module which permits you to select operation with 100, 120, 220 or 230 VAC, 50Hz or 60 Hz power.

The unit contains a microprocessor-controlled centrifuge and a peristaltic pump for dispensing saline solution.

A cabinet supports a centrifugation chamber which is a removable plastic guard bowl. A drive assembly is mounted to the cabinet base. An induction motor is mounted to the drive assembly providing brushless operation. The motor has permanently-sealed self-lubricating ball bearings. The motor shaft projects through the center of the guard bowl. A solenoid plunger and a rotor is set on the motor shaft. A cover assembly forms the top section of the chamber. The aluminum cover assembly consists of a feed-dispensing nozzle for inserting saline solution into the tubes in the rotor, a cylindrical splash guard for directing the decanted waste into the drain hole in the chamber, a latch, and a viewport for easy speed verification.

When the cover is closed and latched, an interlock prevents the cover from opening when the rotor is in motion. The interlock also prevents operation when the cover is not closed and latched except in the CALIBRATE MODE. The remaining electrical and electronic components, along with the saline solution peristaltic pump and the rotor drive assembly, are located on the base section of the cabinet.



If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Safety Symbols

Safety symbols used in the manual or on the equipment mean the following:

„I“ On

„0“ Off



Important operating instructions. To reduce risk of injury or poor performance of the unit, read the user manual before putting the equipment into operation.



DANGER Indicates an immediately hazardous situation, which if not avoided, will result in death or serious injury.



WARNING Indicates an immediately hazardous situation, which if not avoided, will result in death or serious injury. Also a warning for situations where bloodborne pathogens may be present. Use appropriate precautions and personal protective equipment per your laboratory procedures.



CAUTION Indicates an immediately hazardous situation, which if not avoided, may result in minor to moderate injury.



Indicates situations where dangerous voltages exist and potential for electrical shock is present. Failure to observe these warning may result in electrocution, death or equipment failure.

Installation

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- “Install fuses” on page 2-3
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- “Rotor Removal ” on page 2-4
- “Drain Tube” on page 2-4

Receive the Unit

All units are shipped in protective packaging.

1. Follow the unpacking instructions on the carton.
2. Inspect the unit upon receipt and immediately file any damage claims with the shipper/carrier.
3. Complete and return the postage-paid warranty card.

Prepare the Installation Site

The unit normally resides on a bench top.

1. Place the unit on a clean, dry surface, to make certain that the suction feet at the bottom grip the surface firmly. Keep the area beneath the unit free of debris and loose materials.



CAUTION The resting surface must be level, to ensure quiet, vibration-free operation. A rigid and stable location is important. An improperly loaded centrifuge may vibrate or move.

2. The bottom of the CW2 Plus must be high enough so that the drain hose is pitched downward from the unit to the drain, with no restriction to gravity flow. The drain hose may not be extended or constricted. Reduction of the drain flow can cause saline back up resulting in serious corrosion damage.
3. Locate the unit to allow a clearance of 12 cm (5 inches) on each side of the unit for ventilation. Provide clearance sufficient clearance above the unit to open the cover.



WARNING International Electrotechnical Commission standard 1010 part 2-20 limits the permitted movement of a laboratory centrifuge to 12" (300 mm) in the unlikely event of a disruption. Laboratory management procedures should require that no person or any hazardous materials enter within this boundary while the centrifuge operates.

4. DO NOT plug in the power cord at this time! See Power configuration below.

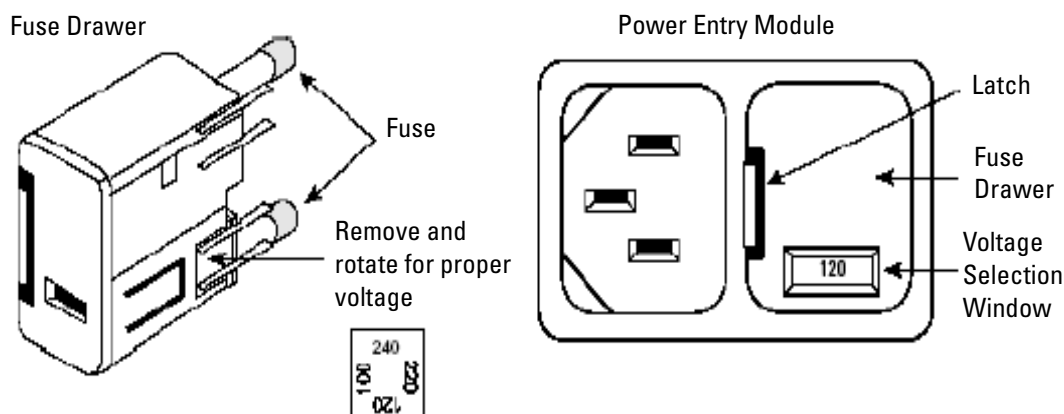
Set Power Configuration

Verify that the correct power cord and connector is provided for your installation.



If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Install fuses



1. Locate the power entry module on the back side of the unit. The removable fuse drawer is located in the module. A small latch holds the drawer in place. Press this latch, then slide the drawer out.
2. Select the correct fuses and insert two fuses in the fuse drawer.

Voltage	Frequency	Part. No.
100 V / 120 V	250 V, 5 A T	49946
220 V / 230 V	250 V, 2.5 A T	49937

3. Ensure that the fuses are securely in place and reinstall the entire drawer into the power entry module

Attach the Correct Power Cord

1. The unit requires a grounded power supply (3-outlet). If your facility does not have grounded power outlets, arrange for proper grounding.



WARNING ELECTRICAL HAZARD! Do not remove the grounding pin from the centrifuge power cord. Do not use the bare wired power cord to attach a power plug that does not have a grounding pin. The power cord provided with the unit is correctly rated for the highest current demand. This power cord should not be interchanged with cords from equipment with lower current demand. Exchange of power cords between equipment may create a fire hazard.

2. The unit is provided with two power cords. One is suitable for North America and Japan. The other is a "Continental Europe" type. Attach the appropriate power cord to the power entry module receptacle on the CW2 Plus.
DO NOT connect to AC outlet at this time.

Rotor Removal

The rotor is packed inside the machine. Unpacking the rotor is necessary to avoid damage to the rotor and the machine.

1. Plug the machine into an AC Power outlet after completing the proper power configuration as described in the previous section.
2. Turn ON the power switch.
3. Press the Cover Open Switch.
4. Remove the rotor and foam packing material.
5. Inspect the rotor.

Drain Tube

The CW2 Plus is shipped with the pump tubing already installed in the peristaltic pump at the rear of the CW2 Plus. The saline supply tubing (including volume control flow valve and supply adapter) is also connected (by a 90° elbow) to the pump tubing which extends from the pump.

1. Connect the saline supply tubing to a saline solution supply container using the adapter.



CAUTION The CW2 Plus has a gravity drain. Therefore be sure the drain tubing flows downward and that it is not restricted in any way

For best results, locate the CW2 Plus next to a sink for draining purposes. Periodically inspect the drain tubing to ensure its proper operation. If the drain line becomes kinked or restricted, drained liquid can back up the drain hose and into the motor compartment causing motor failure.

Operation

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Warnings and Cautions

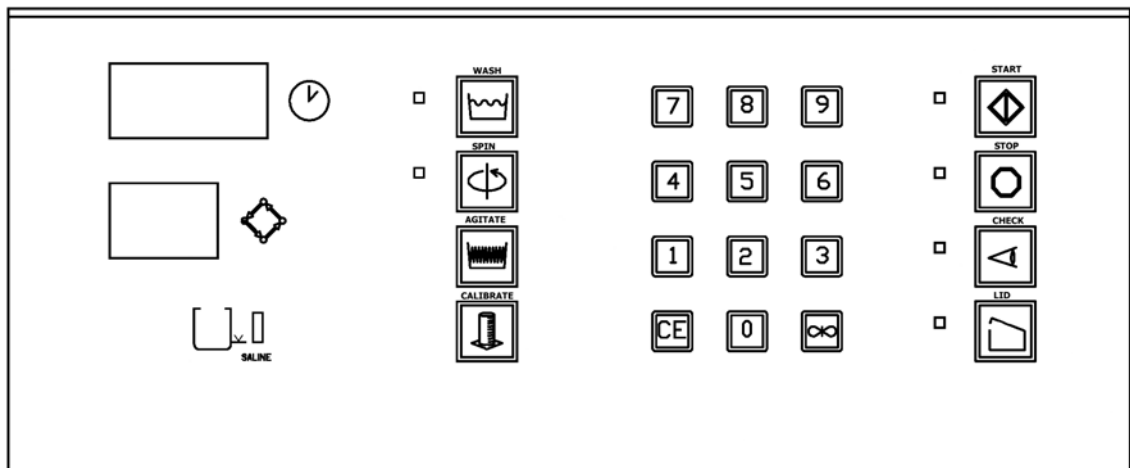


WARNING To Avoid Electric Shock: Plug the power cord into a grounded outlet. Never remove the grounding prong from the power plug, or use any adapter which does not complete the grounding circuit. Always unplug the power cord before attempting to clean or service the centrifuge.



CAUTION Ensure that loads are properly balanced around the rotor to minimize vibration. All Thermo Fisher Scientific accessories are stamped with their weight for easy balancing. Do not block the vents, otherwise, airflow will be restricted. Be sure the rotor and accessories are properly installed before attempting to start a run.

Control Panel



This digital display will show the total time of the spin, or wash, cycle(s) at the start and the remaining time while running. Time shows a maximum of 999 seconds, or 000 for HOLD.

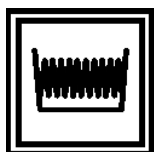


This key is used with the appropriate number (0 through 9) key(s) to use the CW2 Plus as a centrifuge at 2800 rpm (50 Hz) or 3400 rpm (60 Hz) in a timed (from 1 to 999 seconds) run or in an untimed run using the HOLD key. The indicator to the left of this key lights when the SPIN key is pressed indicating that the unit is in the spin mode.

Use at 900 sec or greater requires a 30 min rest period before continued use.



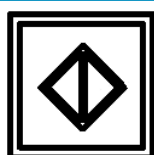
This key is used with the 1, 2, 3, or 4 number keys to enter the desired wash cycle(s). The indicator to the left of this key will light when the WASH key is pressed, indicating that the instrument is in the wash mode. A beep will sound at the end of the wash cycle.



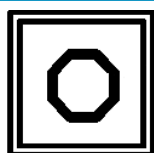
This key is used to select a six-second agitation for resuspension of the cell button.



This key is used to select the calibrate mode in order to set the correct volume of saline solution dispensed for each test tube. It is also used in priming the peristaltic pump.

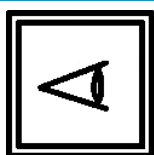


This key is used to start the wash or spin run. The indicator to the left of this key will light when the RUN key is pressed, indicating that the instrument is in the run mode.



This key may be used at any time and in any mode to stop a run. The indicator to the left of this key will light when the stop key is pressed, indicating that the unit is in the brake mode.

Note No changes can be made during a run. All keys are disabled except for the STOP and CHECK keys



This key is used to temporarily interrupt a wash cycle at the end of its current phase (i.e. at the end of fill, spin, decant, or agitate). The cover may be opened (by pressing the OPEN COVER key once the OPEN COVER LED lights) for access to the rotor. Closing the cover and pressing the RUN key will resume the wash cycle run where it was interrupted. The check function can only be used in the wash mode. The indicator to the left of this key lights when the CHECK key is pressed to signal that the unit is in the check mode.



This key is used to power the cover solenoid and open the cover. The indicator to the left of this key will light whenever the Power Switch is in the On position and the rotor is stopped. Press the OPEN COVER key to release the cover.



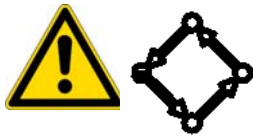
This key is used to select an indefinitely timed spin run. Maximum run time in this mode is 20 min followed by a 30 min rest period.



Clear: This key is used to clear the current displayed TIME or CYCLE numbers.



This indicator lights when the saline solution reservoir is depleted. An alarm also sounds. The CW2 Plus defaults to the check mode, allowing you to hand-fill the tubes, and to prime the pump system. Pressing the RUN key will resume the run.



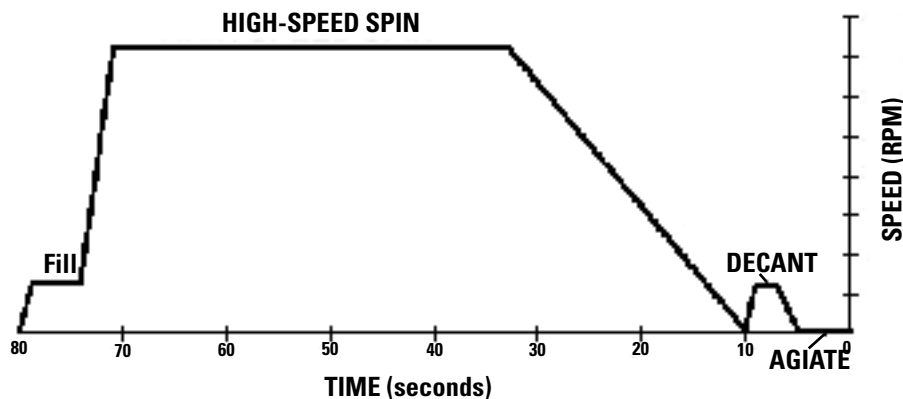
This digital display will show the number of wash cycles initially selected. During a run it displays the number of remaining wash cycles. Maximum number of 4x back to back cycles is 20 followed by a 30 min rest period.

On-Off rocker switch

When the Power Switch is pushed to the ON position, the STOP and the OPEN COVER LED on the control panel will light and zeroes will appear in the TIME and CYCLE digital displays.

Description of Operation

The CW2 Plus can be programmed to run up to four wash cycles. Each basic 80-second wash cycle run is stored in the CW2 Plus system memory until the CLEAR key is pressed, the power switch is pushed, the power is interrupted or the wash mode parameters are changed. The user programs the required number of wash cycles. The system automatically eliminates the “agitate” step from a single, or, the final wash cycle so that the clean pellet is well defined at the completion of the run. Each wash cycle consists of four steps:



1. FILL-Low Speed

Saline wash solution is drawn from the reservoir by the peristaltic pump up through the flow control valve, the flow switch and the cover saline dispensing nozzle. The nozzle feeds the saline into the inlet porthole in the rotor distributor. There the filler tubes feed the saline into the test tubes in a directed stream for maximum resuspension of cells.

2. SPIN-High Speed

The system rapidly accelerates to full speed to pellet the red blood cells. Automatic dynamic braking at the end of this step provides rapid deceleration to prevent resuspension or dislodging of the cell button.

3. DECANT-Low Speed

The rotor holds the tubes at a slight negative angle and spent saline is expelled from the test tubes by low centrifugal force. This action retains virtually all cells in the tubes while effectively removing almost all residual saline. Decanted waste solution is directed, by the splash guard in the cover, into the drain-hole in the chamber (guard bowl) and into the drain tubing which carries the waste out of the CW2 Plus and into a waste container or drain.

4. AGITATE

(except in a single or final wash cycle) This phase is included on all but the final, or a single, wash cycle. By a rapid “stepping” motion of the rotor, cell pellets are disrupted (broken up) for resuspension of the cells during subsequent wash cycles. If desired, the agitation sequence may be manually added at the end of the run.

Operational Precautions

To guarantee accurate test results, the proper use of the CW2 Plus as detailed in this manual and in the testing procedure provided by the reagent manufacturers must be followed.

Make sure that test materials are used within the manufacturers’ recommended dates.

Erroneous antiglobulin readings can result from any of the following:

- The sample serum/cell ratio is improper.
- The red cells were not sufficiently washed.
- The saline solution was improperly decanted.
- The volume calibration has shifted due to change in the saline level or restriction in the feed tube.
- The antiglobulin serum is inactive or outdated.
- The antiglobulin serum was not added to a tube(s).
- The final centrifugation (spin) was improper.
- The reading or recording of results is inaccurate.

This CW2 Plus provides accurate washing, decanting, and a proper speed for the final spin. However, the CW2 Plus and the procedures outlined in this manual will not eliminate all potential errors. To minimize errors, proper laboratory procedures require adequate control of all tests performed.



WARNING When handling and disposing of blood and blood components follow standard laboratory procedures. Observe all safety precautions and standard laboratory practices.

Saline Solution - Priming and Volume Calibration



WARNING Some saline solution contains a sodium azide preservative which may react with the drain plumbing to form dangerous explosive azide salts. Check with the saline solution supplier before discharging waste solutions directly into normal drains.

Long-term exposure to certain preservatives found in azidefree saline solutions may adversely effect certain plastic components within the CW2 Plus. Routine housekeeping and cleaning practices will help to remove salt deposits in, and prolong the life of, these components.

Priming

Priming is required whenever a new saline supply is connected. To prime the instrument:

1. Connect the saline reservoir to the cube adapter of the pump tubing.
2. Open the cover and place a receptacle under the saline dispenser nozzle in the cover.



CAUTION When priming or calibrating the pump with the cover open always put a container in front of the nozzle before pressing the calibrate key. (Otherwise, you will get wet!)

3. Press the CALIBRATE key.

Saline will enter the lines. If saline does not reach the receptacle, press the CALIBRATE key again until the lines are full of saline solution and free of air bubbles.

Volume Calibration

This procedure provides the correct volume of saline solution to be distributed to each test tube. Calibration is required daily. Calibration is also required if the saline reservoir has been replaced or pump tubing replaced.

1. Push the Power Switch to the on position.
2. The OPEN COVER LED lights.
3. Press the OPEN COVER key.
4. The cover will open.
5. Hold a 100 ml graduated cylinder directly under the saline dispenser in the cover.



CAUTION When priming or calibrating the pump with the cover open always put a container in front of the nozzle before pressing the calibrate key. (Otherwise, you will get wet!)

6. Press the CALIBRATE key.

A volume of saline will dispense into the cylinder. This volume should be:

VOLUME TOTAL	TUBE SIZE
54 ml	12 x 75 mm tubes
40 ml	10 x 75 mm tubes

If the volume is not correct, turn the flow valve on the saline supply tubing clockwise (CW) to decrease volume flow or counter clockwise (CCW) to increase volume flow. Recheck by following this procedure starting at step 5. Repeat this procedure as necessary.

The CW2 Plus must be Calibrated for a 1 2 tube load even though fewer tubes may be used.

Wash Mode

Wash Cycle

The wash mode can consist of 1, 2, 3 or 4 wash cycles. To perform an automatic wash:

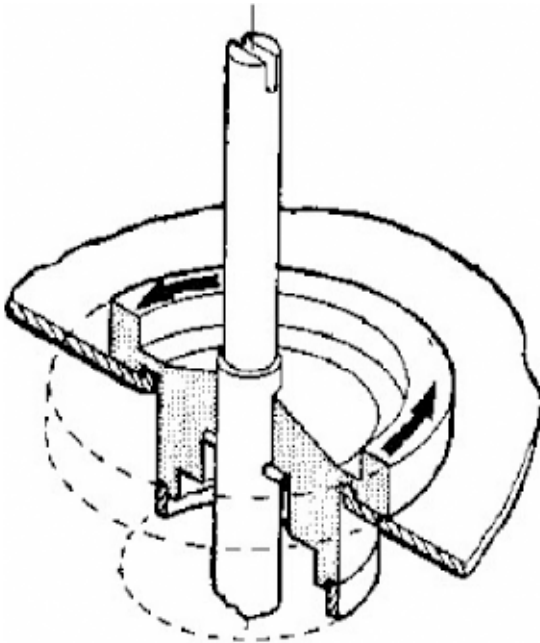
1. Push the POWER SWITCH to the ON position. The TIME and the CYCLE displays will show zeroes. The STOP LED and OPEN COVER LED will light.
2. Press the OPEN COVER key and raise the cover.
3. Install the solenoid plunger onto the drive assembly shaft.
4. Turn the solenoid plunger counterclockwise (CCW) until the slot in its underside completely engages the pin in the drive assembly shaft.

The solenoid plunger is correctly seated when it cannot be turned independently of the motor shaft.

5. Carefully install and seat the rotor onto the drive assembly shaft.
6. Turn the rotor counterclockwise (CCW) until it rests on the drive assembly shaft and engages the slot at the top of the drive assembly shaft. The rotor is properly seated when it cannot be turned independently of the solenoid plunger.
7. Install tubes symmetrically in the rotor.



CAUTION The rotor must be run with a balanced load or damage to the rotor and instrument can occur.



8. Close the cover and press the WASH key.
9. Press the appropriate number key 1, 2, 3 or 4 for the desired wash cycle(s).

The selected cycle number will appear on the CYCLE display. Also, the TIME display will show 80,160, 240 or 320 seconds for the respective 1, 2, 3 or 4 wash cycles.

10. Press the RUN key.

The RUN LED will light, and the TIME display will show the run time remaining.

11. You may stop the run by pressing the STOP key for immediate braking or pressing the CHECK key to pause after the current step (Fill, Spin, Decant or Agitate). If the STOP key was used, then the wash cycle will start from the beginning when restarted.



CAUTION If saline flow is interrupted or depleted, the run stops, an alarm sounds and the ADD SALINE LED lights.

The CHECK key is operable only in the WASH mode. Pressing the CHECK key stops the run between two steps. The run will continue from there when the cover is closed and the RUN key is pressed.

12. At the end of the run the OPEN COVER LED will light, and an alarm will sound. Press the OPEN COVER key and raise the cover.

Spin Mode

In this mode the CW2 Plus can be operated at high speed as a centrifuge in a timed run or in an untimed (HOLD) run.

Timed

1. Press the SPIN key and enter the desired centrifugation run time from 1 through 999 seconds. The selected time will appear on the TIME display.
2. Press the RUN key. In the timed mode the rotor will accelerate to, and spin at high speed for the designated time. The remaining time to spin will be displayed continuously in the TIME display and then the unit will shut off automatically.



CAUTION If agitation is desired prior to spin: press the SPIN Key; press the AGITATE key, then press the appropriate run time keys. Now the instrument is programmed for a six-second agitation prior to centrifugation.

Untimed (Hold)

1. Press the SPIN key and then press the HOLD key.
2. Press the RUN key.

The rotor will accelerate to, and spin at, high speed until the STOP key is pressed.

Agitate Mode



CAUTION Agitation can only be performed with the cover closed.

Press the AGITATE key to obtain a six-second agitation.



CAUTION An agitate can be added to the spin cycle by pressing the SPIN and AGITATE keys.

Operating Procedure

1. Press the POWER switch to the ON position.
The STOP LED and the OPEN COVER LED will light and the TIME and CYCLE displays will show zeroes.
2. Press the OPEN COVER key and raise the cover.
3. Install the tubes symmetrically in the rotor.



CAUTION The rotor must be run with a balanced load or damage to the rotor and instrument can occur.

4. Close the cover.
5. Press the WASH Key.
6. Press the desired number of washes (1-4).
7. Press the RUN Key to initiate the wash cycle.
8. The STOP LED, and the OPEN COVER LED will light when the wash cycle(s) is complete.
9. Press the OPEN COVER key and raise the cover.
10. Add the appropriate amount of anti-human serum to the tubes.
11. Close the cover.
12. Press the SPIN key and, if desired, the AGITATE key. (If AGITATE key is pressed the tubes will be agitated for six-seconds and then spun).
13. ENTER the number of seconds for the desired cycle time.
14. Press the RUN key to begin the spin cycle.
15. At the end of the entered time the STOP LED and the OPEN COVER LED will light. When the spin cycle(s) is complete; press the OPEN COVER key and raise the cover. Remove the tubes and read the results.
16. Add IgG-sensitized control cells to all negative reactions and replace the tubes in the rotor. Be sure the load is symmetrically balanced.
17. Repeat steps 14 and 15.



CAUTION Once the preceding programmed wash and spin cycles have been entered, they remain in the memory unless the CLEAR key is pressed, the Power Switch is pushed, the wash mode parameters are changed or the power is interrupted. Therefore, simply press the WASH key or SPIN key. Then press the RUN key. The run cycle will include all the previously entered number of wash cycles or spin time, and agitate, if programmed.

Anti-Human Globulin

The following Anti-Human Globulin Test protocol can be used as a check of proper CW2 Plus operation.

Perform the operational tests with a full rotor of twelve (12) either the 10 mm x 75 mm tubes or the 12 x 75 mm tubes as described below:

1. Add up to six (6) drops of AB serum and one (1) drop of a 2-5% red cell suspension in each tube.
2. Run the tubes through three (3) wash cycles with tubes at least 80% filled [approximately 40 ml total for twelve (12) 10 x 75 mm tubes and 54 ml total for twelve 12 x 75 mm tubes for each wash].
3. Add two (2) drops of anti-human serum to each tube.
4. Agitate tubes and spin for 15-20 seconds. Examine for agglutination. All tubes should give negative reactions.
5. Add one (1) drop of Coombs control cells to each negative tube.
6. Agitate tubes and spin for 15 seconds. Examine for agglutination. All tubes should give positive reactions.

3 Operation
Anti-Human Globulin

Maintenance

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- “Condition of Returned Equipment ” on page 4-7

Preventive Maintenance

Interval	Action
Daily	<p>1. Inspect tubing and connections. Make sure all tubing is securely connected and free from obstructions. Make certain that drain tubing is not restricted and that saline waste can flow through freely by gravity.</p> <p>2. Inspect interior bowl (Remove guard bowl). Make certain that the bowl is clean and free of dried saline crystals and other debris. It is important to wipe out the bowl daily with a damp sponge or cloth.</p> <p>3. Check saline fill volume. Using the CALIBRATE key and a graduated cylinder, make certain the unit delivers 40 mL of saline if using 10 x 75 mm tubes or 54 mL if using 12 x 75 mm tubes. If the volume delivered is below the required amount adjust the saline flow valve (clockwise to decrease the amount of saline and counterclockwise to increase the flow).</p>
Weekly	<p>1. Flush tubing with a 1:10 solution of household bleach (0.5% Sodium Hypochlorite). Prepare enough diluted bleach to run through four wash cycles (approximately 200 ml). Install the rotor and plunger. CAUTION Do not run wash cycles without the rotor and plunger installed. Damage to the bearing may result. Remove the saline supply tube from the saline reservoir. Press the CALIBRATE key until all saline is pumped out of the line. Connect the saline supply line to the bleach solution and program the unit to Wash 4 (four) times. Remove the saline supply line from the bleach solution and again empty the line by pressing the CALIBRATE key. Then connect the saline supply tubing to at least one liter of distilled water and fill the line by pressing the CALIBRATE key. Run the unit through enough Wash cycles to use all of the distilled water. Again clear the line using the CALIBRATE key.</p> <p>Reconnect the saline supply line to the saline reservoir and prime the unit using the CALIBRATE key. Make certain that the inner bowl is wiped out to remove any excess moisture before resuming use of the CW2 Plus.</p> <p>2. Clean the rotor and solenoid plunger. Remove the solenoid plunger and wash with plenty of warm water and a mild detergent (paying particular attention to the bore.) Rinse thoroughly under warm water. Take a damp cloth and wipe any saline residue from the well that the plunger sits in. Replace the solenoid plunger. Remove rotor from the unit and wash with warm water and a mild detergent. Direct running water into the hole in the top of the rotor for several minutes and make sure water is flowing freely out of all filler tubes. Direct water into the slot of each tube holder and the shaft hole in the bottom. Install and spin the rotor in the CW2 Plus for approximately 20 seconds to remove excess water.</p>

Interval	Action						
Three Months	<p>1. Check motor speed.</p> <p>Set the power switch to ON. Press the SPIN key. Press the HOLD key. Press the START key. Allow the motor to accelerate to speed. Shine a stroboscope or tachometer through the viewport in the cover to verify the speed as indicated below.</p> <p>If the motor is not spinning at the correct speed, you should notify your Service Representative. Press the STOP key. Set the power switch to OFF. Replace the solenoid plunger and rotor.</p> <table border="1"> <thead> <tr> <th>Power Frequency</th> <th>RPM</th> </tr> </thead> <tbody> <tr> <td>50 Hz</td> <td>2800-3000</td> </tr> <tr> <td>60 Hz</td> <td>3400-3600</td> </tr> </tbody> </table> <p>2. Check spin time.</p> <p>Press the SPIN key and enter the length of spin time. Press RUN. As soon as the spin cycle starts (start of spin can be determined by listening for hum), start the stopwatch. Stop the stopwatch when the time display reads 000. Verify that spin time is correct.</p>	Power Frequency	RPM	50 Hz	2800-3000	60 Hz	3400-3600
Power Frequency	RPM						
50 Hz	2800-3000						
60 Hz	3400-3600						

Replacement Parts

The following parts may be replaced by the user.

Description	Cat. No.
Guard Bowl	50402
Pump Head Tubing Kit	50019
Valve	65450
Fuse - 100 / 120 VAC, 5 A, 5 x 20 mm	49946
Fuse - 220 / 230 VAC, 2.5 A, 5 x 20 mm	49937
Solenoid Plunger	44919
Rotor	477
Cover Splash Guard	50247
Spare Parts Kit	50008

Guard Bowl Removal

1. Set the POWER switch to the ON position and open the cover.
2. Set the POWER switch to the OFF position.
3. Unplug the power cord.
4. Remove the rotor and solenoid plunger.
5. Wipe the inside of the guard bowl completely dry.
6. Pull up the three white guard bowl retainers approximately 1/4 inch.
7. Carefully lift the guard bowl out of the cabinet. Do not allow saline solution on the guard bowl drain to drip into the motor shaft area.

8. Examine the interior and exterior surfaces of the guard bowl for cracks or holes. If damaged, or if the surfaces are sticky to the touch, replace it with a new one, otherwise wash it with warm water and mild detergent.

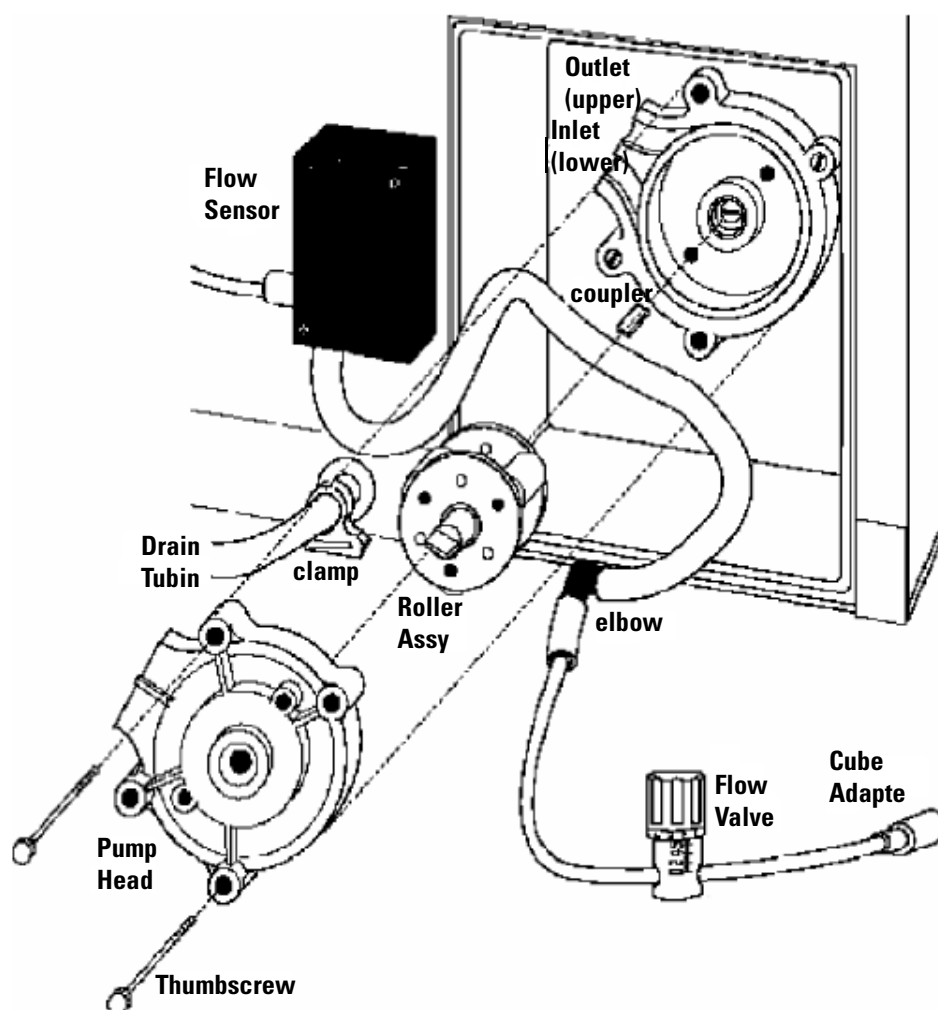
Guard Bowl Replacement:

1. Place the guard bowl in the cabinet opening; orient the guard bowl so that the drain faces the rear of the unit and fits into the drain hole of the inner splash guard.
2. Insert the lower portion of the three retainers into the holes in the cabinet before locking in place with the thumb buttons.
3. Replace the solenoid plunger; turn it counterclockwise (CCW) until it is properly seated.
4. Replace the rotor; turn it counterclockwise (CCW) until it is properly seated.

Pump Tubing Replacement

Refer to the figure on the next page when replacing pump tubing.

1. Unplug line cord from power source.
2. At the rear of the unit, remove the two thumbscrews that hold the pump head in place. Pull out the front half of the pump head and the roller assembly to free up the tubing.
3. Disconnect the tubing attached to the bottom of the flow sensor and remove the tubing from the saline supply. Discard the entire tubing set.
4. Attach the new tubing set (already assembled) by connecting the pump tubing end to the flow sensor (short tubing end). Be sure that it is pushed all the way up.
5. Insert the pump rollers into the pump head (long end of shaft outward). Turn the pump shaft by hand to verify that the pump motor is coupled.
6. Wrap the pump tubing portion around the rollers with the elbow at the bottom.
7. With one hand, place both ends of the pump tubing into the channels and gently pull the ends (stretching the tubing). With the other hand, attach the pump head front half over the back half (pump halves should be flush against each other). Insert the thumbscrews and fasten them. Take care to avoid pinching the tubing (turning the pump shaft during alignment/fastening may help).



CAUTION Do not use a sharp object to fit the tubing in place as this may damage the tubing.

8. Gently pull on the drain tubing (to unkink it), and slide its clamp up the tubing as close to the cabinet assembly as possible. Tighten it in place to prevent kinking.
9. Visually inspect all tubing to ensure that none is kinked. Turn the pump shaft by hand to ensure proper operation. Connect the cube adapter to saline cube nozzle (or insert entire tube end into any saline container). Slide the flow valve to a convenient location along the inlet tubing. Plug the line cord back in, and calibrate.



CAUTION Failure to ensure this proper seating before operating the pump, may result in damage to the drive unit.

The supplied silicone tubing is specially manufactured for use in the peristaltic pump. Do not use any other tubing. Improper installation of peristaltic pump silicone tubing may significantly shorten its life. Failure to hold a slight tension of the pump tubing during installation may cause binding of the pump tube to the roller and possible damage to the pump.

Decontamination



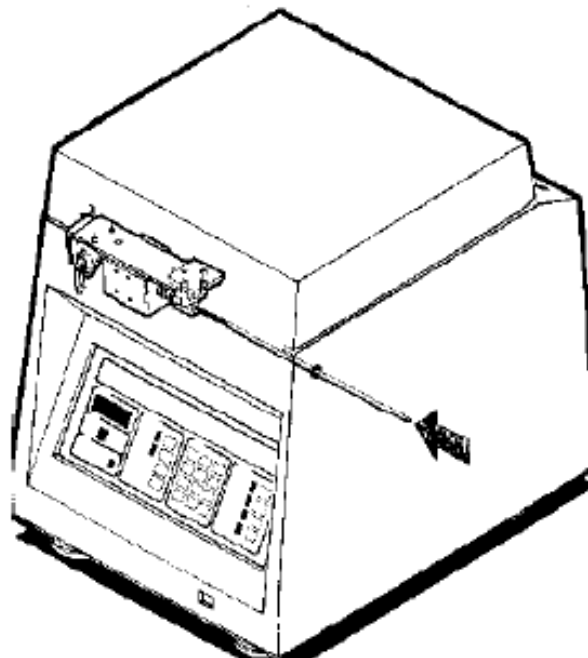
WARNING All materials of human origin should be handled as potentially infectious materials.

1. Always wear protective gloves when handling blood, blood component or blood contaminated materials.
2. Clean blood spills according to your institution's recommended procedure for decontamination or that described in the latest revision of the National Committee for Clinical Laboratory Standards (NCCLS) guidelines for the protection of laboratory workers from instrument biohazards.
3. Wipe instrument with a damp towel (water only) and thoroughly dry.

Cover Interlock Bypass

In the event of a power failure, the cover interlock has a mechanical bypass for sample retrieval. To bypass the interlock:

1. Turn the POWER switch to the OFF position and unplug the CW2 Plus.
2. Locate the access hole in the upper right hand corner of the CW2 Plus (remove the cover plug).
3. Place an insulated rod approximately 6 inches straight through the opening. Push gently to disengage the latch.



4. Replace the cover plug and turn the POWER switch back to ON.

Condition of Returned Equipment

Obtain a return goods authorization (RGA) before returning equipment to the manufacturer. The RGA paperwork includes a Certificate of Decontamination for you to sign. It indicates that you have performed the proper steps for decontaminating the unit.



WARNING All returned units must be decontaminated, free of radioactivity, and free of hazardous, infectious, pathogenic, or toxic materials.

All return equipment shipments will be refused until the signed certificate is received. You must prepay transportation to the service depot.

4 Maintenance
Condition of Returned Equipment

Specifications

Electrical Requirements	100 / 120 V, 60 / 50 Hz, 5 A 220 / 230 V, 50 / 60 Hz, 2.5 A
Motor Type	2 speed induction
High Speed Spin (50 Hz)	2800-3000 rpm ¹
High Speed Spin (60 Hz)	3400-3600 rpm ¹
Low Speed Decant (50 Hz or 60 Hz)	550-600 rpm ¹
Altitude	2000 m
Pollution	Degree 2
Installation Category	II
LENGTH OF MODES:	
Automatic	total cycle time 80 seconds
Manual	timed to 999 seconds, or indefinite in hold mode
TUBE TOLERANCES:	
Diameter	10 mm or 12 mm +/-0.09 mm
Length	75 mm +/- 2 mm
CW2 Plus DIMENSIONS:	
Depth	16 3/8 inches (41.6 cm)
Width	12 5/8 inches (32.1 cm)
Height:	
Cover closed	15 3/16 inches (38.6 cm)
Cover open	25 inches (63.3 cm)
Mass (weight): Net	45 lbs. (20.4 kg)
PACKING CASE DIMENSIONS:	
Depth	17 1/4 inches (43.8 cm)
Width	20 1/8 inches (51.1 cm)
Height	28 inches (71.1 cm)
AMBIENT TEMPERATURE:	
Operation	10° C to 35° C
Storage	20° C to 70° C
RELATIVE HUMIDITY:	
Operation	20 to 90%
Non-Operation	5 to 95%
Storage	

¹No Load

Specifications subject to change without notice.

Chemical Compatibility Chart

CHEMICAL	MATERIAL	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN™	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL™	NYLON	PET ¹ , POLYCLEAR™, CLEARCRIMP™	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A™, TEFLON™	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON™	VITON™	
2-mercaptoethanol	S	S	U	-	S	M	S	-	S	U	S	S	U	S	S	-	S	S	S	S	U	S	S	S	S	S	S	S	
Acetaldehyde	S	-	U	U	-	-	-	M	-	U	-	-	-	M	U	U	U	U	M	M	-	M	S	U	-	S	-	U	
Acetone	M	S	U	U	S	U	M	S	S	U	U	S	U	S	U	U	U	U	S	S	U	U	S	M	M	S	U	U	
Acetonitrile	S	S	U	-	S	M	S	-	S	S	U	S	U	M	U	U	-	S	M	U	U	S	S	S	S	S	U	U	
Alconox™	U	U	S	-	S	S	S	-	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	U	
Allyl Alcohol	-	-	-	U	-	-	S	-	-	-	-	S	-	S	S	M	S	S	S	S	-	M	S	-	-	S	-	-	
Aluminum Chloride	U	U	S	S	S	S	U	S	S	S	S	S	M	S	S	S	S	-	S	S	S	S	S	M	U	U	S	S	
Formic Acid (100%)	-	S	M	U	-	-	U	-	-	-	-	U	-	S	M	U	U	S	S	-	U	S	-	U	S	-	U		
Ammonium Acetate	S	S	U	-	S	S	S	-	S	S	S	S	S	S	S	U	-	S	S	S	S	S	S	S	S	S	S	S	
Ammonium Carbonate	M	S	U	S	S	S	S	S	S	S	S	S	S	S	U	U	-	S	S	S	S	S	S	S	M	S	S	S	
Ammonium Hydroxide (10%)	U	U	S	U	S	S	M	S	S	S	S	S	-	S	U	M	S	S	S	S	S	S	S	S	S	S	S	M	S
Ammonium Hydroxide (28%)	U	U	S	U	S	U	M	S	S	S	S	S	U	S	U	M	S	S	S	S	S	S	S	S	S	S	S	M	S
Ammonium Hydroxide (conc.)	U	U	U	U	S	U	M	S	-	S	-	S	U	S	U	U	S	S	S	-	M	S	S	S	S	S	-	U	
Ammonium Phosphate	U	-	S	-	S	S	S	S	S	S	S	S	-	S	S	M	-	S	S	S	S	S	S	S	M	S	S	S	
Ammonium Sulfate	U	M	S	-	S	S	U	S	S	S	S	S	S	S	S	S	-	S	S	S	S	S	S	S	U	S	S	U	
Amyl Alcohol	S	-	M	U	-	-	S	S	-	M	-	S	-	M	S	S	S	S	M	-	-	-	U	-	S	-	M		
Aniline	S	S	U	U	S	U	S	M	S	U	U	U	U	U	U	U	-	S	M	U	U	S	S	S	S	U	S		
Sodium Hydroxide (<1%)	U	-	M	S	S	S	-	-	S	M	S	S	-	S	M	M	S	S	S	S	S	S	S	M	S	S	-	U	

A Chemical Compatibility Chart

CHEMICAL	MATERIAL	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELIRIN™	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL™	NYLON	PET ¹ , POLYCLEAR™, CLEARCRIMP™	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A™, TEFLON™	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON™	VITON™
Sodium Hydroxide (10%)	U	-	M	U	-	-	U	-	M	M	S	S	U	S	U	U	S	S	S	S	S	S	S	M	S	S	-	U
Barium Salts	M	U	S	-	S	S	S	S	S	S	S	S	S	S	S	M	-	S	S	S	S	S	S	M	S	S	S	S
Benzene	S	S	U	U	S	U	M	U	S	U	U	S	U	U	U	M	U	M	U	U	U	U	S	U	U	S	U	S
Benzyl Alcohol	S	-	U	U	-	-	M	M	-	M	-	S	U	U	U	U	U	U	U	-	M	S	M	-	S	-	S	
Boric Acid	U	S	S	M	S	S	U	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S
Cesium Acetate	M	-	S	-	S	S	S	-	S	S	S	S	-	S	S	-	-	S	S	S	S	S	S	M	S	S	S	S
Cesium Bromide	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	S	-	-	S	S	S	S	S	M	S	S	S	S
Cesium Chloride	M	S	S	U	S	S	S	-	S	S	S	S	S	S	S	S	-	-	S	S	S	S	S	M	S	S	S	S
Cesium Formate	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	S	-	-	S	S	S	S	S	M	S	S	S	S
Cesium Iodide	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	S	-	-	S	S	S	S	S	M	S	S	S	S
Cesium Sulfate	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	S	-	-	S	S	S	S	S	M	S	S	S	S
Chloroform	U	U	U	U	S	S	M	U	S	U	U	M	U	M	U	U	U	U	M	M	U	U	S	U	U	U	M	S
Chromic Acid (10%)	U	-	U	U	S	U	U	-	S	S	S	U	S	S	M	U	M	S	S	U	M	S	M	U	S	S	S	S
Chromic Acid (50%)	U	-	U	U	-	U	U	-	-	-	S	U	U	S	M	U	M	S	S	U	M	S	-	U	M	-	S	
Cresol Mixture	S	S	U	-	-	-	S	-	S	U	U	U	U	U	U	-	-	U	U	-	U	S	S	S	S	U	S	
Cyclohexane	S	S	S	-	S	S	S	U	S	U	S	S	U	U	U	M	S	M	U	M	M	S	U	M	M	U	S	
Deoxycholate	S	S	S	-	S	S	S	-	S	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	S	S	S	S
Distilled Water	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Dextran	M	S	S	S	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S
Diethyl Ether	S	S	U	U	S	S	S	U	S	U	U	S	U	U	U	U	U	U	U	U	U	U	S	S	S	S	M	U
Diethyl Ketone	S	-	U	U	-	-	M	-	S	U	-	S	-	M	U	U	U	M	M	-	U	S	-	-	S	U	U	
Diethylpyrocarbonate	S	S	U	-	S	S	S	-	S	S	U	S	U	S	U	-	-	S	S	S	M	S	S	S	S	S	S	
Dimethylsulfoxide	S	S	U	U	S	S	S	-	S	U	S	S	U	S	U	U	-	S	S	U	U	S	S	S	S	U	U	
Dioxane	M	S	U	U	S	S	M	M	S	U	U	S	U	M	U	U	-	M	M	M	U	S	S	S	S	U	U	
Ferric Chloride	U	U	S	-	-	-	M	S	-	M	-	S	-	S	-	-	-	S	S	-	-	-	M	U	S	-	S	
Acetic Acid (Glacial)	S	S	U	U	S	S	U	M	S	U	S	U	U	U	U	U	M	S	U	M	U	S	U	U	S	-	U	
Acetic Acid (5%)	S	S	M	S	S	S	M	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S	M	S	S	M
Acetic Acid (60%)	S	S	U	U	S	S	U	-	S	M	S	U	U	M	U	S	M	S	M	S	M	S	M	U	S	M	U	
Ethyl Acetate	M	M	U	U	S	S	M	M	S	S	U	S	U	M	U	U	-	S	S	U	U	S	M	M	S	U	U	

CHEMICAL	MATERIAL	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN™	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORLYL™	NYLON	PET ¹ , POLYCLEAR™, CLEARCRIMP™	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A™, TEFLON™	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON™	VITON™
Ethyl Alcohol (50%)	S	S	S	S	S	S	S	M	S	S	S	S	S	U	S	U	S	S	S	S	S	S	S	S	M	S	M	U
Ethyl Alcohol (95%)	S	S	S	U	S	S	M	S	S	S	S	S	S	U	S	U	-	S	S	S	M	S	S	S	U	S	M	U
Ethylene Dichloride	S	-	U	U	-	-	S	M	-	U	U	S	U	U	U	U	U	U	U	-	U	S	U	-	S	-	S	
Ethylene Glycol	S	S	S	S	S	S	S	S	S	S	S	S	S	-	S	U	S	S	S	S	S	S	S	S	M	S	M	S
Ethylene Oxide Vapor	S	-	U	-	-	U	-	-	S	U	-	S	-	S	M	-	-	S	S	S	U	S	U	S	S	S	U	
Ficoll-Hypaque™	M	S	S	-	S	S	S	-	S	S	S	S	-	S	S	-	S	S	S	S	S	S	S	S	M	S	S	S
Hydrofluoric Acid (10%)	U	U	U	M	-	-	U	-	-	U	U	S	-	S	M	U	S	S	S	S	M	S	U	U	U	-	-	
Hydrofluoric Acid (50%)	U	U	U	U	-	-	U	-	-	U	U	U	U	S	U	U	U	S	S	M	M	S	U	U	U	-	M	
Hydrochloric Acid (conc.)	U	U	U	U	-	U	U	M	-	U	M	U	U	M	U	U	U	-	S	-	U	S	U	U	U	-	-	
Formaldehyde (40%)	M	M	M	S	S	S	S	M	S	S	S	S	M	S	S	S	S	U	S	S	M	S	S	S	M	S	M	U
Glutaraldehyde	S	S	S	S	-	-	S	-	S	S	S	S	S	S	S	-	-	S	S	S	-	-	S	S	S	-	-	
Glycerol	M	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	-	S	S	S	S	S	S	S	S	S	S
Guanidine Hydrochloride	U	U	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	U	S	S	S	
Haemo-Sol™	S	S	S	-	-	-	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	S	S	S	S	S
Hexane	S	S	S	-	S	S	S	-	S	S	U	S	U	M	U	S	S	U	S	S	M	S	U	S	S	U	S	
Isobutyl Alcohol	-	-	M	U	-	-	S	S	-	U	-	S	U	S	S	M	S	S	S	-	S	S	S	-	S	-	S	
Isopropyl Alcohol	M	M	M	U	S	S	S	S	U	S	S	U	S	U	M	S	S	S	S	S	S	S	S	M	M	M	S	
Iodoacetic Acid	S	S	M	-	S	S	S	-	S	M	S	S	M	S	S	-	M	S	S	S	S	S	M	S	S	M	M	
Potassium Bromide	U	S	S	-	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	-	S	S	S	M	S	S	S	
Potassium Carbonate	M	U	S	S	S	S	S	-	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	
Potassium Chloride	U	S	S	-	S	S	S	S	S	S	S	S	S	S	S	-	S	S	S	S	S	S	S	U	S	S	S	
Potassium Hydroxide (5%)	U	U	S	S	S	S	M	-	S	S	S	S	-	S	U	S	S	S	S	S	S	S	M	U	M	S	U	
Potassium Hydroxide (conc.)	U	U	M	U	-	-	M	-	M	S	S	-	U	M	U	U	U	S	M	-	M	U	-	U	U	-	U	
Potassium Permanganate	S	S	S	-	S	S	S	-	S	S	S	U	S	S	S	M	-	S	M	S	U	S	S	M	S	U	S	
Calcium Chloride	M	U	S	S	S	S	S	S	S	S	S	S	S	S	M	S	-	S	S	S	S	S	S	M	S	S	S	

A Chemical Compatibility Chart

CHEMICAL	MATERIAL	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELIRIN™	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL™	NYLON	PET ¹ , POLYCLEAR™, CLEARCRIMP™	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A™, TEFLON™	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON™	VITON™
Calcium Hypochlorite	M	-	U	-	S	M	M	S	-	M	-	S	-	S	M	S	-	S	S	S	S	M	S	M	U	S	-	S
Kerosene	S	S	S	-	S	S	S	U	S	M	U	S	U	M	M	S	-	M	M	M	S	S	U	S	S	U	S	
Sodium Chloride (10%)	S	-	S	S	S	S	S	S	-	-	-	S	S	S	S	S	-	S	S	S	S	S	-	S	S	M	-	S
Sodium Chloride (sat'd)	U	-	S	U	S	S	S	-	-	-	-	S	S	S	S	S	-	S	S	-	S	-	S	S	M	-	S	
Carbon Tetrachloride	U	U	M	S	S	U	M	U	S	U	U	S	U	M	U	S	S	M	M	S	M	M	M	M	M	U	S	S
Aqua Regia	U	-	U	U	-	-	U	-	-	-	-	-	U	U	U	U	U	U	U	-	-	-	-	-	-	S	-	M
Solution 555 (20%)	S	S	S	-	-	-	S	-	S	S	S	S	S	S	S	S	-	-	S	S	S	-	S	S	S	S	S	S
Magnesium Chloride	M	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S
Mercaptoacetic Acid	U	S	U	-	S	M	S	-	S	M	S	U	U	U	U	-	S	U	U	S	M	S	U	S	S	S	S	
Methyl Alcohol	S	S	S	U	S	S	M	S	S	S	S	S	U	S	U	M	S	S	S	S	S	S	S	S	M	S	M	U
Methylene Chloride	U	U	U	U	M	S	S	U	S	U	U	S	U	U	U	U	U	U	M	U	U	U	S	S	M	U	S	U
Methyl Ethyl Ketone	S	S	U	U	S	S	M	S	S	U	U	S	U	S	U	U	U	U	S	S	U	U	S	S	S	S	U	U
Metrizamide™	M	S	S	-	S	S	S	-	S	S	S	S	-	S	S	-	-	S	S	S	S	S	S	S	M	S	S	S
Lactic Acid (100%)	-	-	S	-	-	-	-	-	-	M	S	U	-	S	S	S	M	S	S	-	M	S	M	S	S	-	S	
Lactic Acid (20%)	-	-	S	S	-	-	-	-	-	M	S	M	-	S	S	S	S	S	S	S	M	S	M	S	S	-	S	
N-Butyl Alcohol	S	-	S	U	-	-	S	-	-	S	M	-	U	S	M	S	S	S	S	S	M	M	S	M	-	S	-	S
N-Butyl Phthalate	S	S	U	-	S	S	S	-	S	U	U	S	U	U	U	M	-	U	U	S	U	S	M	M	S	U	S	
N, N-Dimethylformamide	S	S	S	U	S	M	S	-	S	S	U	S	U	S	U	U	-	S	S	U	U	S	M	S	S	S	U	
Sodium Borate	M	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	-	S	S	S	S	S	S	S	M	S	S	S
Sodium Bromide	U	S	S	-	S	S	S	-	S	S	S	S	S	S	S	S	-	S	S	S	S	S	S	S	M	S	S	S
Sodium Carbonate (2%)	M	U	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S
Sodium Dodecyl Sulfate	S	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S
Sodium Hypochlorite (5%)	U	U	M	S	S	M	U	S	S	M	S	S	S	M	S	S	S	S	M	S	S	S	M	U	S	M	S	
Sodium Iodide	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S	
Sodium Nitrate	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	-	S	S	S	S	S	U	S	S	S	S	

CHEMICAL	MATERIAL																											
	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN™	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL™	NYLON	PET ¹ , POLYCLEAR™, CLEARCRIMP™	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A™, TEFLON™	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON™	VITON™	
Sodium Sulfate	U	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	
Sodium Sulfide	S	-	S	S	-	-	-	S	-	-	-	S	S	S	U	U	-	-	S	-	-	-	S	S	M	-	S	
Sodium Sulfite	S	S	S	-	S	S	S	S	M	S	S	S	S	S	S	M	-	S	S	S	S	S	S	S	S	S	S	
Nickel Salts	U	S	S	S	S	S	-	S	S	S	-	-	S	S	S	S	-	S	S	S	S	S	S	M	S	S	S	
Oils (Petroleum)	S	S	S	-	-	-	S	U	S	S	S	S	U	U	M	S	M	U	U	S	S	S	U	S	S	S		
Oils (Other)	S	-	S	-	-	-	S	M	S	S	S	S	U	S	S	S	S	U	S	S	S	S	-	S	S	M	S	
Oleic Acid	S	-	U	S	S	S	U	U	S	U	S	S	M	S	S	S	S	S	S	S	S	S	M	U	S	M	M	
Oxalic Acid	U	U	M	S	S	S	U	S	S	S	S	S	U	S	U	S	S	S	S	S	S	S	U	M	S	S		
Perchloric Acid (10%)	U	-	U	-	S	U	U	-	S	M	M	-	-	M	U	M	S	M	M	-	M	S	U	-	S	-	S	
Perchloric Acid (70%)	U	U	U	-	-	U	U	-	S	U	M	U	U	M	U	U	U	M	M	U	M	S	U	U	S	U	S	
Phenol (5%)	U	S	U	-	S	M	M	-	S	U	M	U	U	S	U	M	S	M	S	U	U	S	U	M	M	M	S	
Phenol (50%)	U	S	U	-	S	U	M	-	S	U	M	U	U	U	U	U	S	U	M	U	U	S	U	U	U	M	S	
Phosphoric Acid (10%)	U	U	M	S	S	S	U	S	S	S	S	U	-	S	S	S	S	S	S	S	S	U	M	U	S	S		
Phosphoric Acid (conc.)	U	U	M	M	-	-	U	S	-	M	S	U	U	M	M	S	S	S	M	S	M	S	U	M	U	-	S	
Physiologic Media (Serum, Urine)	M	S	S	S	-	-	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
Picric Acid	S	S	U	-	S	M	S	S	S	M	S	U	S	S	S	U	S	S	S	S	U	S	U	M	S	M	S	
Pyridine (50%)	U	S	U	U	S	U	U	-	U	S	S	U	U	M	U	U	-	U	S	M	U	S	S	U	U	U	U	
Rubidium Bromide	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S	
Rubidium Chloride	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S	
Sucrose	M	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
Sucrose, Alkaline	M	S	S	-	S	S	S	-	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	M	S	S	S	
Sulfosalicylic Acid	U	U	S	S	S	S	S	-	S	S	S	U	S	S	S	-	S	S	S	-	S	S	U	S	S	S	S	
Nitric Acid (10%)	U	S	U	S	S	U	U	-	S	U	S	U	-	S	S	S	S	S	S	S	S	S	M	S	S	S	S	
Nitric Acid (50%)	U	S	U	M	S	U	U	-	S	U	S	U	U	M	M	U	M	M	M	S	S	S	U	S	S	M	S	
Nitric Acid (95%)	U	-	U	U	-	U	U	-	-	U	U	U	U	M	U	U	U	U	M	U	U	S	U	S	S	-	S	
Hydrochloric Acid (10%)	U	U	M	S	S	S	U	-	S	S	S	U	U	S	U	S	S	S	S	S	S	S	U	M	S	S	S	

A Chemical Compatibility Chart

CHEMICAL	MATERIAL	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELIRIN™	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL™	NYLON	PET ¹ , POLYCLEAR™, CLEARCRIMP™	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A™, TEFLON™	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON™	VITON™
Hydrochloric Acid (50%)	U	U	U	U	U	S	U	U	-	S	M	S	U	U	M	U	U	S	S	S	S	M	S	M	U	U	M	M
Sulfuric Acid (10%)	M	U	U	S	S	U	U	-	S	S	M	U	S	S	S	S	S	S	S	S	S	S	S	U	U	U	S	S
Sulfuric Acid (50%)	M	U	U	U	S	U	U	-	S	S	M	U	U	S	U	U	M	S	S	S	S	S	S	U	U	U	M	S
Sulfuric Acid (conc.)	M	U	U	U	-	U	U	M	-	-	M	U	U	S	U	U	U	M	S	U	M	S	U	U	U	-	S	
Stearic Acid	S	-	S	-	-	-	S	M	S	S	S	S	-	S	S	S	S	S	S	S	S	S	S	M	M	S	S	S
Tetrahydrofuran	S	S	U	U	S	U	U	M	S	U	U	S	U	U	U	-	M	U	U	U	U	S	U	S	S	U	U	
Toluene	S	S	U	U	S	S	M	U	S	U	U	S	U	U	U	S	U	M	U	U	U	S	U	S	U	U	M	
Trichloroacetic Acid	U	U	U	-	S	S	U	M	S	U	S	U	U	S	M	-	M	S	S	U	U	S	U	U	U	M	U	
Trichloroethane	S	-	U	-	-	-	M	U	-	U	-	S	U	U	U	U	U	U	U	U	U	S	U	-	S	-	S	
Trichloroethylene	-	-	U	U	-	-	-	U	-	U	-	S	U	U	U	U	U	U	U	U	U	S	U	-	U	-	S	
Trisodium Phosphate	-	-	-	S	-	-	M	-	-	-	-	-	-	S	-	-	S	S	S	-	-	S	-	-	S	-	S	
Tris Buffer (neutral pH)	U	S	S	S	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
Triton X-100™	S	S	S	-	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
Urea	S	-	U	S	S	S	S	-	-	-	-	S	S	S	M	S	S	S	S	-	S	S	S	M	S	-	S	
Hydrogen Peroxide (10%)	U	U	M	S	S	U	U	-	S	S	S	U	S	S	S	M	U	S	S	S	S	S	S	M	S	U	S	
Hydrogen Peroxide (3%)	S	M	S	S	S	-	S	-	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S		
Xylene	S	S	U	S	S	S	M	U	S	U	U	U	U	U	U	M	U	M	U	U	U	S	U	M	S	U	S	
Zinc Chloride	U	U	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	
Zinc Sulfate	U	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
Citric Acid (10%)	M	S	S	M	S	S	M	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	

¹ Polyethyleneterephthalate

Key

S Satisfactory

M M = Moderate attack, may be satisfactory for use in centrifuge depending on length of exposure, speed involved, etc.; suggest testing under actual conditions of use.

U U = Unsatisfactory, not recommended.

-- Performance unknown; suggest testing, using sample to avoid loss of valuable material.

Chemical resistance data is included only as a guide to product use. Because no organized chemical resistance data exists for materials under the stress of centrifugation, when in doubt we recommend pretesting sample lots.

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