SORVALL®

SORVALL®
Surespin™ 630

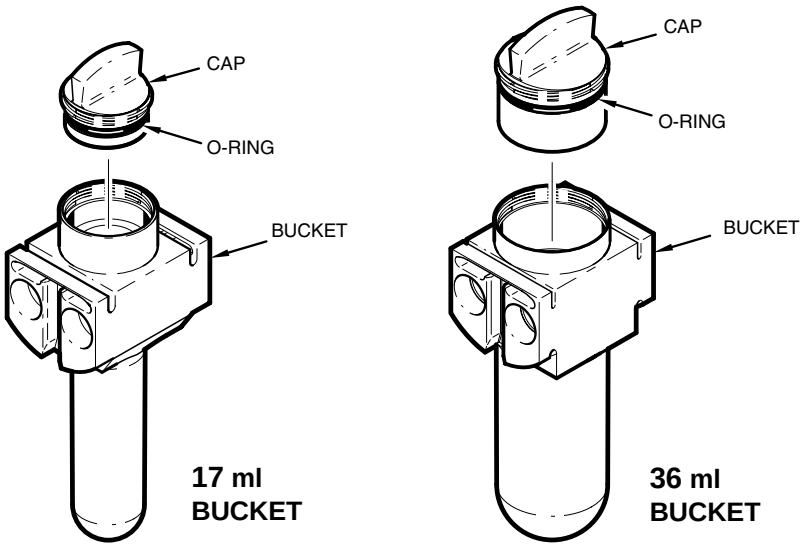
ROTOR MANUAL

PN 79369-3

IMPORTANT NOTICE

regarding use of
SORVALL® Surespin™ 630 Swinging-Bucket Ultracentrifuge Rotor
and changes to the instructions in the Rotor Manual, PN 79369

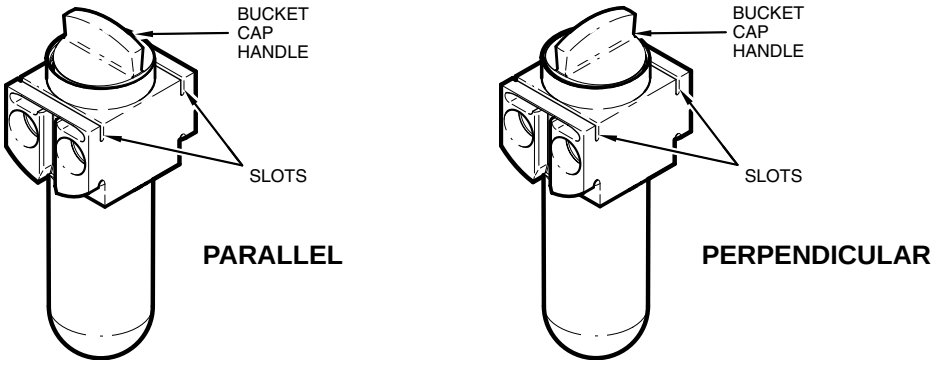
The Surespin™ 630 Rotor you have been supplied is slightly different than as described in the rotor manual. It has been updated with an improved bucket and bucket cap design for better handling. The rotor manual describes caps with two locking tabs that, once engaged in the top of the bucket, seal with a 3/8-turn; instead, the buckets and caps supplied have a fine, precision thread (see illustration).



To use the new improved buckets and bucket caps supplied, load the buckets as directed in the rotor manual, with the following exceptions:

- Instead of applying lubricant to the locking tabs on each bucket cap and to the 3/8-turn threads in each bucket, apply a thin coat of lubricant to the fine threads on each bucket cap.

- When sealing each bucket, slide the cap down until the threads on the cap seat on the threads in the bucket, then gently rotate the cap clockwise until the bucket cap seats firmly on the shoulder inside the bucket (typically around 3/4 of a turn). When the bucket cap is properly tightened, the handle should either be approximately parallel (as with the previous version described in the manual) or approximately perpendicular to the slots on the bucket (see illustration).



- To remove the bucket cap, gently turn the cap in the direction indicated by the arrows, counterclockwise.

All other information and instructions in the manual apply to the new style buckets and caps.

Issued 10/01

OPERATING INSTRUCTIONS

SORVALL® *Surespin™ 630*

Swinging Bucket Ultracentrifuge Rotor

Asheville, North Carolina
U.S.A.

SORVALL®

PN 79369-3
Issued October 2001

This manual is a guide for use of the

SORVALL® Surespin™ 630 Titanium Swinging Bucket Ultracentrifuge Rotor

Data herein has been verified and is believed adequate for the intended use of the rotor. Because failure to follow the recommendations set forth in this manual could produce personal injury or property damage, always follow the recommendations set forth herein. Kendro does not guarantee results and assumes no obligation for the performance of rotors or other products that are not used in accordance with the instructions provided. This publication is not a license to operate under, nor a recommendation to infringe upon, any process patents.

Publications prior to the Issue Date of this manual mat contain data in apparent conflict with that provided herein. Please consider all data in this manual to be the most current.

WARNING, ***CAUTION***, and ***NOTE*** within the text of this manual are used to emphasize important and critical instructions.

WARNING informs the operator of a hazard or an unsafe practice that could result in personal injury, affect the operator's health, or contaminate the environment.

CAUTION informs the operator of an unsafe practice that could result in damage of equipment.

NOTE highlights essential information.

CAUTION and ***WARNING*** are accompanied by a hazard symbol  and appear in the left sidebar near the information they correspond to.

Important Safety Information

Certain potentially dangerous conditions are inherent to the use of all rotors. To ensure safe operation of this rotor, anyone using it should be aware of all safe practices and take all precautions described below and throughout this manual.

⚠ *WARNING*

When using radioactive, toxic, or pathogenic materials, be aware of all characteristics of the materials and the hazards associated with them in the event leakage occurs during centrifugation. In the event of a rotor failure, neither the centrifuge nor the rotor can protect you from particles dispersed in the air. To protect yourself, we recommend additional precautions be taken to prevent exposure to these materials, for example, use of controlled ventilation or isolation areas.

Always be aware of the possibility of contamination when using radioactive, toxic, or pathogenic materials. Take all necessary precautions and use appropriate decontamination procedures if exposure occurs.

Never use any material capable of producing flammable or explosive vapors or creating extreme exothermic reactions.

Never exceed the maximum rated speed of the installed rotor; to do so can cause rotor failure.

Always reduce (derate) rotor speed as instructed in this manual whenever:

- the rotor speed/temperature combination exceeds the solubility of the gradient material and causes it to precipitate.
- the compartment load exceeds the maximum allowable compartment mass specified (the average fluid density is greater than 1.2 g/ml). See Chapter 2, Operation.

Failure to reduce rotor speed under these conditions can cause rotor failure.

⚠ *CAUTION*

Do not expose aluminum rotor components to: strong acids, bases, or alkaline laboratory detergents, liquid chlorine bleach or salts (chlorides) of heavy metals such as cesium, lead, silver, or mercury. Use of these materials with aluminum can cause a chemical reaction that initiates corrosion.

Do not operate or precool a rotor at the critical speed, as this will have a detrimental effect on centrifuge component life. See Chapter 2, Operation.

Do not operate the rotor unless it is symmetrically balanced as described in this manual. Operating the rotor out of balance can cause damage to the centrifuge. See Chapter 2, Operation.

Always maintain the rotor in the recommended manner. All accessories must be clean and inspected prior to each run: do not use rotor showing signs of corrosion or cracking. See Chapter 3, Maintenance.

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List of Illustrations

List of Tables

Chapter 1: DESCRIPTION

This manual contains information required to operate and maintain the SORVALL® Surespin™630 Swinging Bucket Ultracentrifuge Rotor. If you require additional information regarding operation or maintenance, please contact Kendro for assistance. In the United States, call Kendro toll-free 1-800-522-7746; outside the United States, contact the nearest Kendro office (see back cover) or your local representative for SORVALL® products. SORVALL® product information is available on our internet web site at ***http://www.kendro.com*** or ***http://www.kendro.de***.

Rotor Description

The Surespin™630 is a titanium swinging bucket ultracentrifuge rotor that can process up to six tubes of liquid during a single run at speeds up to 30 000 rpm.* Each titanium rotor bucket will hold a centrifuge tube with a nominal fluid capacity of either 36 ml or 17 ml, depending on the buckets purchased. The buckets securely attach to the rotor body, each at its own numbered position, using a simple drop-in loading procedure. Anodized aluminum bucket caps seal each bucket using a quick-access precision thread design. The rotor allows for eye-balancing of tube loads, as well as convenient visual checking of bucket installation and sealing. During a centrifuge run, the buckets swing out horizontally and return to a vertical position during deceleration. An overspeed decal, a disk with alternating black and reflective segments, is attached to the bottom of the rotor to provide for overspeed protection.

Rotor Specifications

a. General

The general specifications apply to the rotor when used with 36 ml or 17 ml buckets.

- Rotor Type . . . . . Swinging Bucket
- Maximum Speed . . . . . 30 000 rpm**
- Number of Buckets 6
- Rotor Diameter – at rest . . . . . 24.9 cm (9.8 inch)
  – at speed . . . . . 33.4 cm (13.2 inch)
- Critical Speed . . . . . 1100 rpm

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* Speed in revolutions per minute (rpm) is related to angular velocity, ω, according to the following:

$$\omega = (\text{rpm}) \left(\frac{2\pi}{60} \right) = (\text{rpm}) (0.10472)$$

Where ω = rad/s. All further references in this manual to speed will be designated as rpm.

** With tubes filled with a homogeneous solution having an average density of 1.2 g/ml or less

b. Rotor with 36 ml Buckets:

- Relative Centrifugal Force (RCF) at maximum speed:
  - at $r_{minimum}$ (7.70 cm) 77 408
  - at $r_{average}$ (12.15 cm) 122 144
  - at $r_{maximum}$ (16.60 cm) 166 880
- K Factor at maximum speed 216
- Total volume capacity (nominal) . . . . . 216 ml
- Tube compartment diameter . . . . . 25 mm (1 inch)
- Tube length (nominal) . . . . . 89 mm (3.5 inch)
- Maximum compartment mass (includes bucket and cap) . . . . . 176.5 g
- Rotor weight including buckets (empty) . . . . 7.9 kg (17.4 lb)

c. Rotor with 17 ml Buckets:

- Relative Centrifugal Force (RCF) at maximum speed:
  - at $r_{minimum}$ (6.70 cm) 67 355
  - at $r_{average}$ (11.65 cm) 117 117
  - at $r_{maximum}$ (16.60 cm) 166 880
- K Factor at maximum speed 255
- Total volume capacity (nominal) . . . . . 102 ml
- Tube compartment diameter . . . . . 16 mm (.63 inch)
- Tube length (nominal) . . . . . 102 mm (4 inch)
- Maximum compartment mass (includes bucket and cap) . . . . . 170.6 g
- Rotor weight including buckets (empty) . . . . 8.0 kg (17.6 lb)

Accessories

The accessories supplied with the Surespin™630 Rotor ordered with complete accessories are listed in Table 1-1. Catalog numbers are: 79362 (with 17 ml buckets), or 79367 (with 36 ml buckets). The Surespin™630 Rotor can also be purchased with basic accessories only, which includes all items listed in Table 1-1 except the tubes. The catalog numbers for the rotor with basic accessories only are: 79363 (17 ml buckets) and 79368 (36 ml buckets).

Table 1-1. Accessories Supplied

Quantity	Catalog Number	Description
1 set	79364 79365	Buckets, 17 ml Buckets, 36 ml
4 boxes of 50 8 boxes of 25	03126* 03141*	Tubes, Polyallomer (17 ml) Tubes, Polyallomer (36 ml)
6	79370* 79374*	O-ring (17 ml buckets) or O-ring (36 ml buckets)
1	51361	Overspeed Decal, 30,000 rpm (extra)
1	52240	Bucket Rack
1	51942	Rotor Storage Stand
1	65937	Vacuum Grease
1	61556	Lubricant
1	52384	Ultraspeed Centrifuge/Rotor Log Book
1	79369	Surespin™630 Rotor Instruction Manual

* The catalog number supplied depends on the size of the buckets ordered with the rotor. No tubes are supplied with catalog numbers 79368, and 79363.

Chapter 2: OPERATION

This chapter contains the information necessary to prepare the Surespin™630 Rotor for operation and includes important safety information.

Prerun Safety Checks

WARNING

Failure to properly maintain your rotor can cause rotor failure with subsequent damage to your centrifuge. Also, depending on the sample being processed, rotor failure can result in biological or radioactive contamination. Therefore, every part of the rotor must be clean and should be carefully inspected before every run. If there is any sign of corrosion or cracking, the rotor should not be used.

To ensure safe performance of the rotor, before every run you should:

a. ***read and observe the Important Safety Information on page iii.***

b. make sure that there are no burrs or scratches on the bucket, bucket seats, or bucket pins.

c. check the centrifuge drive chamber, drive spindle, and mounting surface of the rotor to be sure that they are clean and free of scratches or burrs.

d. make sure that the proper overspeed decal is firmly attached to the bottom of the rotor; it must have 30 black segments or, if the rotor has been derated to 27 000 rpm, 33 black segments (refer to page 3-2 for overspeed decal replacement procedure).

e. inspect the bucket cap O-rings for cracks, tears, or abrasions; replace if necessary.

f. make sure that the numbers on the bucket cap, bucket, and rotor compartment match, and that opposing loads balance.

g. make sure each bucket cap is correctly installed – when tight, the bucket cap handle will either be parallel or perpendicular to the slots (see figure 2-4).

h. after placement in the rotor, move each bucket slightly to ensure that they pivot freely on their pins. When properly installed, the tops of all six buckets will be at the same height.

i. check the chemical compatibility of all materials used (see Table in Appendix).

CAUTION

When using tubes other than those supplied with this rotor, be sure to do a test run for the desired application to check the top speed capability of the tubes being used.

j. be sure that the proper environment has been selected for operation; for example, controlled ventilation or isolation, if required.

k. check the top speed capability of the tube being used.

Bucket Use

The bucket and cap assemblies are weighed, balanced, and supplied as a set of six that, for warranty requirements, should not be mixed with buckets or caps from other sets. For identification, all buckets in a specific set are marked with the same weight, and each bucket and corresponding cap are numbered with rotor compartment position (1 through 6).

If a bucket or cap is damaged so that it must be removed from service, the entire set must be removed from service. If you question whether or not a rotor or bucket set should be used, contact Kendro Service or your local representative for SORVALL® products. When the rotor is removed from service at end of life, the buckets and caps that have been used with that rotor body should be removed from service also.

Derating Rotor Speed

Because of the stresses that the rotor body and buckets must withstand during centrifugation, it is necessary to eventually derate the maximum operating speed of the rotor. Specifically, the maximum speed of 30 000 rpm must be derated to 27 000 rpm after the rotor has been used for 1000 runs. To know when the maximum rotor speed must be lowered, all runs should be recorded in the Ultraspeed Centrifuge/Rotor Log Book supplied.

WARNING

After the rotor has been used for 1000 runs at the derated speed, the rotor body and any set of buckets used with the rotor body should no longer be used.

NOTE After the maximum speed has been derated, the new, lowered maximum speed should be used in all calculations and during all operations for the ensuing 1000 runs. (These runs should also be recorded in the Ultraspeed Centrifuge/Rotor Log Book.) In addition, the overspeed decal on the bottom of the rotor must be replaced with a new decal (Catalog No. 51364) for the lowered speed.

Compartment Loads in Excess of Design Mass

WARNING

When compartment loads exceed design mass, the maximum rotor speed must be reduced using one of the formulas provided. Failure to do so can result in rotor failure.

This method is not appropriate for calculating reduced speed when running gradient materials that could precipitate, such as cesium chloride.

Maximum speed (30 000 rpm [or 27 000 rpm if the rotor has been derated]) is based on a recommended design mass, defined as the maximum mass that can safely be loaded into each rotor compartment for top-speed operation. The compartment mass includes the bucket, bucket cap, specimen and tube. If your actual compartment mass exceeds the recommended design mass, the maximum rotor speed must be reduced proportionately.

Design mass for the Surespin™ 630 rotor varies depending on which buckets are used: design mass for 36 ml buckets is 176.5 g; design mass for 17 ml buckets is 170.6 g. These figures are based on the use of a SORVALL® thinwall polyallomer tube filled with a liquid having an average fluid density of 1.2 g/ml. If the average fluid density of your solution is greater than 1.2 g/ml, use the following formula to determine the reduced speed:

$$\text{Reduced Speed} = 30\,000^{*} \times \sqrt{\frac{1.2}{\text{Average Fluid Density (g/ml)}}}$$

Critical Speed

CAUTION
Continued operation at the critical speed will have a detrimental effect on centrifuge component life.

The critical speed is that speed at which any rotor imbalance will produce a driving frequency equal to the resonant frequency of the rotating system (that is, rotor and the centrifuge drive). At this speed, the rotor may produce large amplitude vibrations which can be felt in the instrument frame. Mass imbalance will contribute to increased vibration intensity at the critical speed. Operation at the critical speed (1100 rpm for the Surespin™ 630 rotor) will have a detrimental effect on centrifuge component life and therefore, should be avoided. ***Observe the CAUTION on the Safety Information Page in the front of this manual.***

Rotor Precool

CAUTION
Do not precool the rotor at the critical speed.

If samples are routinely processed around 4°C or below, the rotor can be stored in a refrigerator or a cold room. If this is not possible, the rotor may be able to be precooled in a SORVALL® Ultracentrifuge. Refer to the individual Ultracentrifuge Instruction Manual for precooling directions.

Chemical Compatibility

The critical components of the Surespin™630 Rotor apt to come in contact with solution are: rotor body (titanium), rotor buckets (titanium), bucket caps (anodized aluminum), O-rings (Viton®), and tubes (polyallomer supplied, other tube materials vary).

The chemical compatibility of rotor elements and accessory materials is given in the Appendix. Because no organized chemical resistance data exists for materials under the stress of centrifugation, this data is intended to be used only as a guide. When in doubt, we recommend pretesting of sample lots.

* 27 000 rpm if rotor has been derated.

Relative Centrifugal Force (RCF) Determination

RCF refers to the force during centrifugation that moves the particulate outward from the center of rotation. This force is proportional to the radial distance and the square of the rotor speed. The RCF value is determined by the following formula:

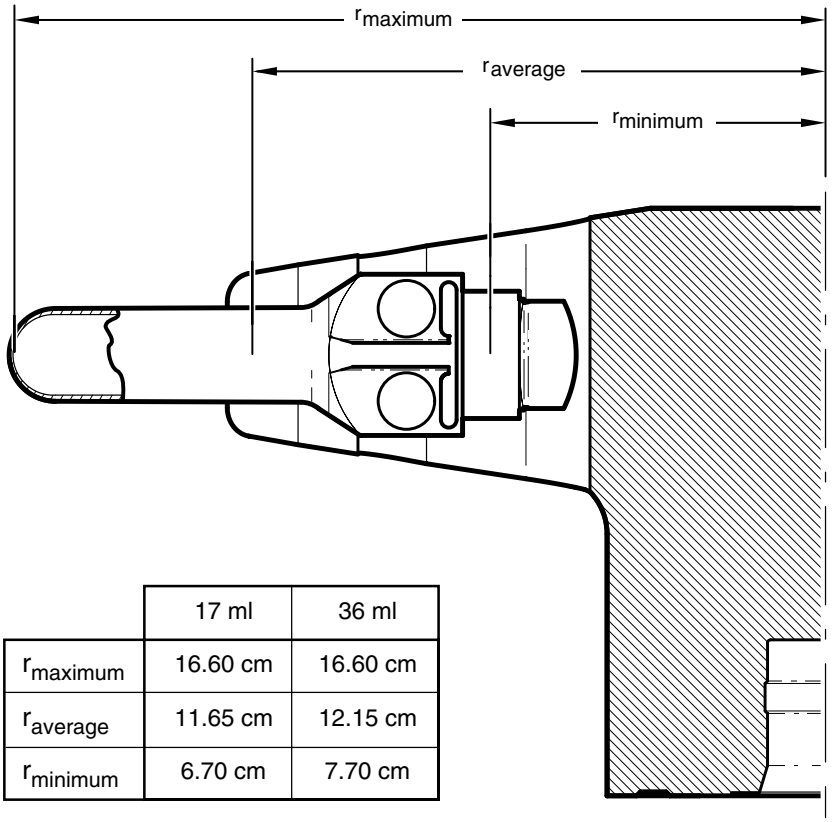
$$RCF = 11.17\ (r) \left(\frac{rpm}{1000} \right)^2$$

when r = the radius in centimeters from the centerline of the rotor to the point in the tube where RCF value is required

and rpm = the rotor speed in revolutions per minute

Figure 2-1 shows the minimum, average, and maximum radii of the Surespin™630. Table 2-1 gives the RCF value at each radius at speeds from 5000 rpm to 30 000 rpm (in increments of 500 rpm). The RCF value at any other given speed can be calculated by using the above formula.

NOTE The radii values given are the actual rotor specifications; these values do not take the thickness of the tube into consideration.



	17 ml	36 ml
$r_{maximum}$	16.60 cm	16.60 cm
$r_{average}$	11.65 cm	12.15 cm
$r_{minimum}$	6.70 cm	7.70 cm

Figure 2-1. Cross-Section Showing Rotor Radii

Table 2-1. Surespin™ 630 RCF Values and K Factors

17 ml Buckets					36 ml Buckets				
Speed (rpm)	RCF			K Factor	Speed (rpm)	RCF			K Factor
	$r_{maximum}$ 16.60 cm	$r_{average}$ 11.65 cm	$r_{minimum}$ 6.70 cm			$r_{maximum}$ 16.60 cm	$r_{average}$ 12.15 cm	$r_{minimum}$ 7.70 cm	
5 000	4 636	3 253	1 871	9182	5 000	4 636	3 393	2 150	7774
5 500	5 609	3 936	2 264	7588	5 500	5 609	4 105	2 602	6425
6 000	6 675	4 685	2 694	6376	6 000	6 675	4 886	3 096	5399
6 500	7 834	5 498	3 162	5433	6 500	7 834	5 734	3 634	4600
7 000	9 086	6 376	3 667	4685	7 000	9 086	6 650	4 214	3966
7 500	10 430	7 320	4 210	4081	7 500	10 430	7 634	4 838	3455
8 000	11 867	8 328	4 790	3587	8 000	11 867	8 686	5 505	3037
8 500	13 397	9 402	5 407	3177	8 500	13 397	9 805	6 214	2690
9 000	15 019	10 541	6 062	2834	9 000	15 019	10 993	6 967	2399
9 500	16 734	11 744	6 754	2543	9 500	16 734	12 248	7 762	2153
10 000	18 542	13 013	7 484	2295	10 000	18 542	13 572	8 601	1944
10 500	20 443	14 347	8 251	2082	10 500	20 443	14 963	9 482	1763
11 000	22 436	15 746	9 056	1897	11 000	22 436	16 422	10 407	1606
11 500	24 522	17 210	9 897	1736	11 500	24 522	17 948	11 375	1470
12 000	26 701	18 739	10 777	1594	12 000	26 701	19 543	12 385	1350
12 500	28 972	20 333	11 694	1469	12 500	28 972	21 206	13 439	1244
13 000	31 336	21 992	12 648	1358	13 000	31 336	22 936	14 536	1150
13 500	33 793	23 716	13 639	1260	13 500	33 793	24 734	15 675	1066
14 000	36 343	25 506	14 668	1171	14 000	36 343	26 600	16 858	992
14 500	38 985	27 360	15 735	1092	14 500	38 985	28 534	18 083	924
15 000	41 720	29 279	16 839	1020	15 000	41 720	30 536	19 352	864
15 500	44 548	31 264	17 980	955	15 500	44 548	32 606	20 664	809
16 000	47 468	33 313	19 159	897	16 000	47 468	34 743	22 018	759
16 500	50 481	35 428	20 375	843	16 500	50 481	36 949	23 416	714
17 000	53 587	37 608	21 628	794	17 000	53 587	39 222	24 857	672
17 500	56 785	39 852	22 919	750	17 500	56 785	41 563	26 340	635
18 000	60 077	42 162	24 248	708	18 000	60 077	43 972	27 867	600
18 500	63 461	44 537	25 614	671	18 500	63 461	46 449	29 437	568
19 000	66 937	46 977	27 017	636	19 000	66 937	48 993	31 049	538
19 500	70 507	49 482	28 458	604	19 500	70 507	51 606	32 705	511
20 000	74 169	52 052	29 936	574	20 000	74 169	54 286	34 404	486
20 500	77 924	54 687	31 451	546	20 500	77 924	57 034	36 145	462
21 000	81 771	57 388	33 004	521	21 000	81 771	59 851	37 930	441
21 500	85 711	60 153	34 594	497	21 500	85 711	62 734	39 758	420
22 000	89 744	62 983	36 222	474	22 000	89 744	65 686	41 628	402
22 500	93 870	65 879	37 887	453	22 500	93 870	68 706	43 542	384
23 000	98 088	68 839	39 590	434	23 000	98 088	71 793	45 499	367
23 500	102 399	71 865	41 330	416	23 500	102 399	74 949	47 498	352
24 000	106 803	74 955	43 107	399	24 000	106 803	78 172	49 541	337
24 500	111 300	78 111	44 922	382	24 500	111 300	81 463	51 627	324
25 000	115 889	81 332	46 774	367	25 000	115 889	84 822	53 756	311
25 500	120 571	84 617	48 664	353	25 500	120 571	88 249	55 927	299
26 000	125 345	87 968	50 591	340	26 000	125 345	91 744	58 142	288
26 500	130 213	91 384	52 556	327	26 500	130 213	95 306	60 400	277
27 000	135 173	94 865	54 558	315	27 000	135 173	98 937	62 701	267
27 500	140 225	98 411	56 597	304	27 500	140 225	102 635	65 044	257
28 000	145 371	102 022	58 674	293	28 000	145 371	106 401	67 431	248
28 500	150 609	105 698	60 788	283	28 500	150 609	110 235	69 861	239
29 000	155 940	109 440	62 940	273	29 000	155 940	114 137	72 334	231
29 500	161 363	113 246	65 129	264	29 500	161 363	118 106	74 849	223
30 000	166 880	117 117	67 355	255	30 000	166 880	122 144	77 408	216

Calculation of Sedimentation Times in Aqueous (Non-Gradient) Solutions

The time required to sediment a particle in water at 20°C through the maximum rotor path length (that is, the distance between $r_{minimum}$ and $r_{maximum}$) can be estimated using the equation:

$$t = \frac{K}{S_{20,w}}$$

where:

- t = sedimentation time in hours
- K = the clearing factor for the rotor (defined below).
- $S_{20,w}$ = the sedimentation coefficient for the particle of interest in water at 20°C as expressed in Svedbergs*

The clearing, or K factor, is defined by the equation:

$$K = (250\,000)\left[\ln\left(\frac{r_{maximum}}{r_{minimum}}\right)\right] \div \left(\frac{\text{rotor speed}}{1000}\right)^2$$

Where $r_{maximum}$ and $r_{minimum}$ are the maximum and minimum rotor radii, respectively, and rotor speed is expressed in rpm.

K factors for the Surespin™630 rotor at speeds from 5000 rpm to 30 000 rpm have been listed in Table 2-1.

Example: The Surespin™630 Rotor has a K factor of 255 at the maximum speed (30 000 rpm) when 17 ml buckets are used. If the particles to be sedimented have a sedimentation coefficient of 40 S, the estimated run time required at maximum speed will be:

$$t = \frac{255}{40S} = 6.4 \text{ hours} = 6 \text{ hours, } 24 \text{ minutes}$$

Note that the calculation assumes particles in water at 20°C; if the suspending medium is denser or more viscous than water, the sedimentation time will be greater.

* The sedimentation coefficient (S) in seconds, for a particle in a centrifugal field is defined by the equation $S = (dx/dt)\,[1/(\omega^2 x)]$; where dx/dt = sedimentation velocity of the particle in cm/s; ω = rotor speed in rad/s; and x = the distance of the particle from the axis of rotation in centimeters. Conventionally, experimentally determined values of sedimentation coefficients are multiplied by 10^{13} to convert them to Svedberg units (S), so a particle with an experimentally determined sedimentation coefficient of 10^{-11} seconds is usually referred to in the literature as a "100 S particle." Since the value determined for the sedimentation coefficient is dependent on the density and viscosity of the solution in which centrifugation is performed, values are usually reported for the standard conditions of infinite dilution in water at 20°C, and designated $S_{20,w}$.

Calculation of Sedimentation Time in Gradient Solutions

The time required to sediment a particle through a density gradient can be calculated using the following formula:

$$t = \frac{K'}{S_{20,w}}$$

where:

- t = sedimentation time in hours
- K' = the clearing factor for the rotor (the value of K' is dependent on the gradient being used, the temperature of the gradient, and the density of the particle being sedimented).
- $S_{20,w}$ = the sedimentation coefficient for the particle of interest in water at 20°C as expressed in Svedbergs*

Table 2-2 gives K' factors for the Surespin™630 Rotor when operated at maximum speed (that is, 30 000 rpm) with particles ranging in density from 1.1 g/ml to 1.9 g/ml. In this case, the K' factors are based on the use of a 5% - 20% (w/w) linear sucrose density gradient at 5°C.

Table 2-2. K' Factors for the Surespin™630 Rotor (at maximum speed)

Particle Density (g/ml)	K' Factor	
	17 ml Bucket	36 ml Bucket
1.1	1485	1244
1.2	828	683
1.3	735	605
1.4	696	572
1.5	675	554
1.6	660	542
1.7	650	533
1.8	642	527
1.9	636	522

*The sedimentation coefficient (S) in seconds, for a particle in a centrifugal field is defined by the equation $S = (dx/dt)\ [1/(\omega^2 x)]$; where dx/dt = sedimentation velocity of the particle in cm/s; ω = rotor speed in rad/s; and x = the distance of the particle from the axis of rotation in centimeters. Conventionally, experimentally determined values of sedimentation coefficients are multiplied by 10^{13} to convert them to Svedberg units (S), so a particle with an experimentally determined sedimentation coefficient of 10^{-11} seconds is usually referred to in the literature as a "100 S particle." Since the value determined for the sedimentation coefficient is dependent on the density and viscosity of the solution in which centrifugation is performed, values are usually reported for the standard conditions of infinite dilution in water at 20°C, and designated $S_{20,w}$.

Rotor Installation

Inspect the rotor and centrifuge as explained in Prerun Safety Checks on page 2-1, then install the rotor as follows:

1. Using both hands, carefully carry the rotor body to the ultracentrifuge rotor chamber.

2. Lower the rotor body into the chamber and gently place it on the drive spindle, making sure that the rotor is fully seated on the drive spindle.

Tube Filling and Bucket Loading

CAUTION

When using tubes other than those supplied with this rotor, be sure to do a test run for the desired application to check the top speed capability of the tubes being used.

The tubes that are supplied with the Surespin™630 are thinwall polyallomer. They are translucent, easily cut or pierced (for sample removal), resistant to most chemicals (see Appendix). The tubes cannot be autoclaved, and are not reusable. For other tubes that can be used with the rotor, refer to the SORVALL® Product Guide.

NOTE The Surespin™ 630 may be run with two, three, four, or six tubes. If six tubes are not required or if not all tubes will have identical contents, consider how the tubes must be configured in the rotor, so that the rotor will be balanced. Buckets are to be run empty if less than six tubes are used (see Figure 2-2).

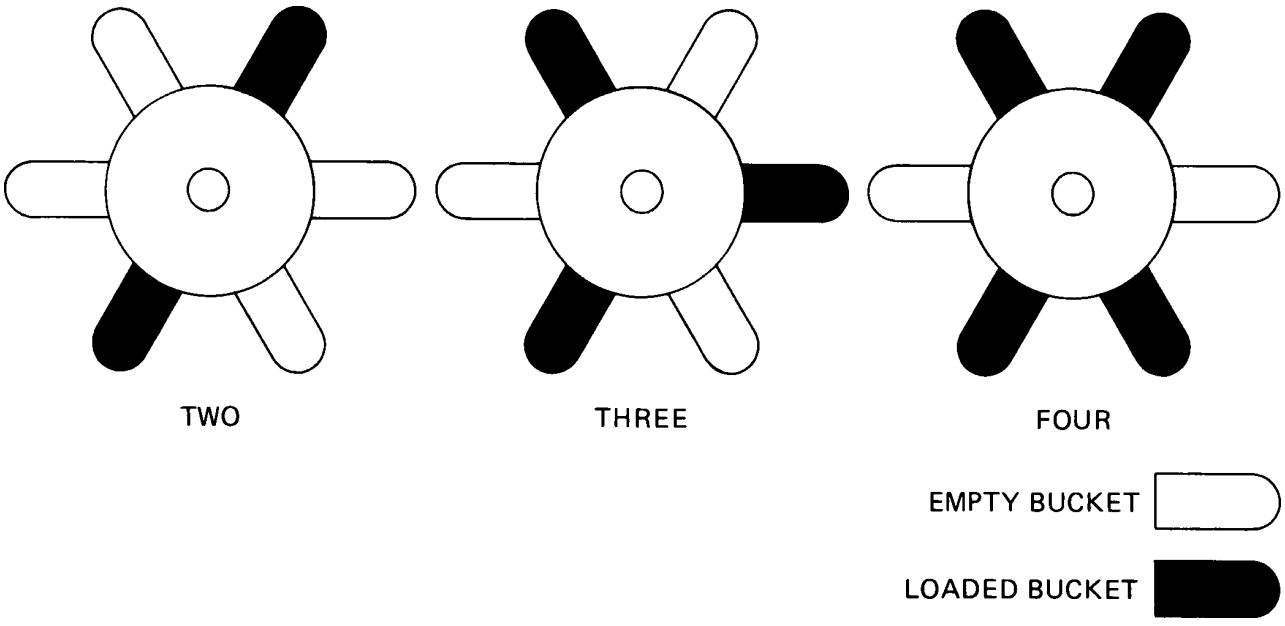


Figure 2-2. Rotor Balancing

Assemble the tube and bucket as follows (see Figure 2-3):

1. Make sure there is a film of vacuum grease (Catalog No. 65937) on each bucket cap O-ring, as well as a thin film of lubricating grease (Catalog No. 61556) on the fine threads on each bucket cap.

2. For thinwall polyallomer tubes supplied with the rotor, fill each tube to within 3 mm (1/8 inch) from the top to prevent the tube from collapsing during centrifugation. If the sample does not fill the tube to this level, add a light mineral oil above the sample or a dense, inert liquid below it.

C A U T I O N

Do not operate this rotor unless it is symmetrically balanced. Operating the centrifuge with the rotor out of balance can cause damage to the centrifuge drive assembly.

NOTE The Surespin™ 630 is designed for stability, and therefore does not require precise adjusting of loads to meet narrow balance criteria. Opposing tubes must contain fluid of identical densities and be filled similarly, but eye-balancing is appropriate.

3. Make sure that the outside of the tubes and the inside of the buckets are completely dry.

NOTE Moisture between the tube and the bucket can cause a difficult-to-break vacuum seal to form during centrifugation and can cause the tube to collapse.

4. Carefully place the tubes into the buckets so that opposing bucket numbers (1 & 4, 2 & 5, and 3 & 6) contain similar loads. If running three tubes (see Figure 2-2), all three must contain similar loads.

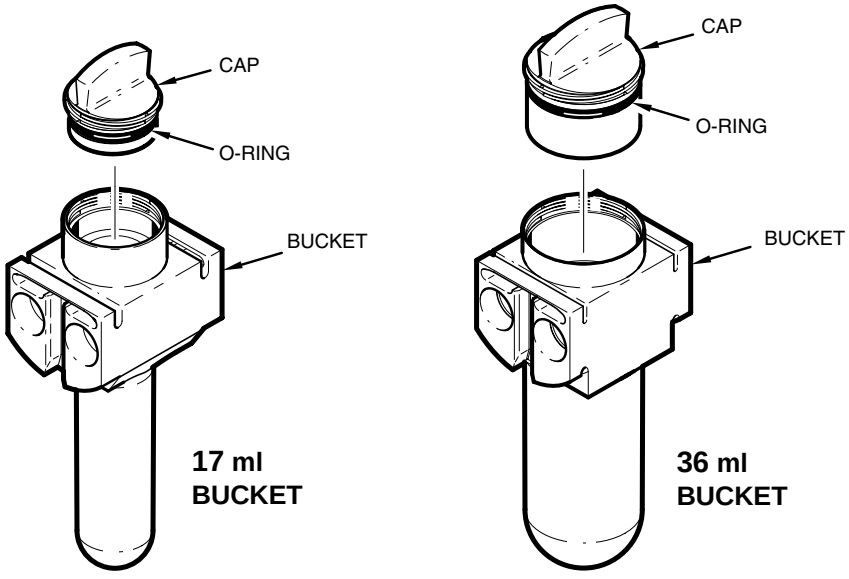


Figure 2-3. Cap and Bucket Assembly

5. Insert each numbered bucket cap into the bucket with the same number, so that the cap threads seat on the bucket threads. Then, rotate each cap clockwise until the cap seats firmly inside the bucket, typically about 3/4 of a turn. When tightened properly, the cap handle should be either parallel or perpendicular (approximately) to the slots on the bucket (see Figure 2-4).

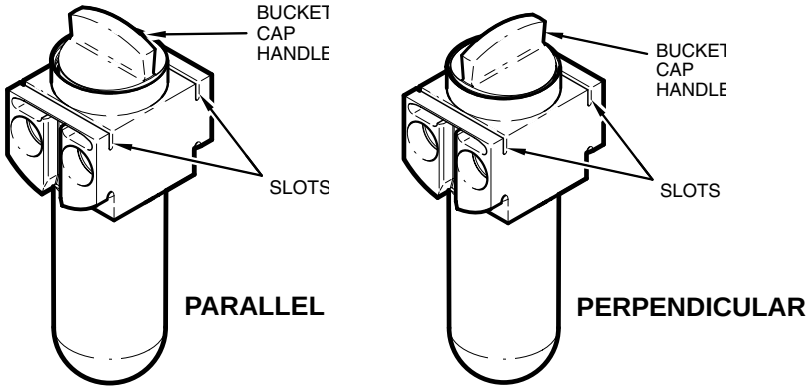


Figure 2-4. Orientation of Bucket Cap Handle with Slots

Installing Buckets and Performing a Run

To install the buckets on the rotor:

1. Being careful to keep the bucket vertical at all times, gently lower a bucket assembly into position until it engages and is fully seated on the two pins on the rotor body.

NOTE The number on the bucket assembly must match the compartment number on the rotor body.

3. Install the other five buckets the same way. Always run all six buckets – if running less than six tubes, sealed empty bucket assemblies must be placed in the remaining positions.

4. Gently rock each bucket assembly slightly to be sure all six pivot freely on their pins. For a visual check, the tops of all six bucket assemblies will be at the same height when properly installed.

5. Complete any Prerun Safety Checks (page 2-1) that have not yet been done, then ***observe all WARNINGS and CAUTIONS on the Important Safety Information page in the front of this manual***, and perform the run as explained in the centrifuge instruction manual.

6. Record the run data in the Ultraspeed Centrifuge/Rotor Log Book supplied (see Centrifuge/Rotor Log, below).

7. To remove the bucket caps at the end of the run, gently turn each cap handle in the direction indicated by the arrows, counterclockwise.

Centrifuge/Rotor Log

An Ultraspeed Centrifuge/Rotor Log Book is supplied with the Surespin™ 630 Rotor so that you can easily record all data necessary to meet the warranty stipulation that any defective Ultraspeed Centrifuge Rotor (or Ultracentrifuge) being returned to Kendro must be accompanied by an up-to-date history of the rotor (see Warranty Statement, Appendix).

Each time the Surespin™ 630 Rotor is used, record the run in the log book as shown in Figure 2-5, below

SORVALL® Ultraspeed Centrifuge/Rotor Log

RUN TIME *(List by Rotor Used)*

					Rotor AH-629 S/N 8731384		Rotor TV-865 S/N 9130129		Rotor T-1270 S/N 8931255		Rotor T-880 S/N 9030040		*This log is for use with one centrifuge ONLY:* Model ULTRA 80 Ser. No. 9102448
Date	Operator	Rev. Count @ Run Start	TEMP	SPEED	HRS : MIN		HRS : MIN		HRS : MIN		HRS : MIN		Remarks*
9/4/91	J. JONES	00410290	4	57.0			5	30					PLASMID PREP.
9/5/91	B. SMITH	00429100	4	21.0	26	00							SUCROSE GRADIENT
9/7/91	J. JONES	00461860	21	70.0					18	00			LIPOPROTEIN SEP.

*Use Remarks column to record any other significant information (such as service data or run conditions).

Figure 2-5. Sample Centrifuge/Rotor Log Sheet

Chapter 3: MAINTENANCE

Corrosion

The Surespin™630 rotor body and buckets are made of titanium and the bucket caps are made of anodized aluminum, however, even though titanium is stronger and more resistant to corrosion, they should be maintained and kept clean in the same manner. Proper care will lessen the chances of rotor failure and significantly prolong the useful life of the rotor.

Corrosion commonly refers to chemical reactions at the surface (such as rusting and pitting) recognized by growing areas of visible deterioration. On the other hand, stress corrosion attacks the inside of the metal; barely detectable surface cracks grow inward, weakening the part without visible warning. Stress corrosion applies to most commonly used alloys, even the corrosion resistant alloys have been found susceptible.

Stress corrosion is thought to be initiated by certain combinations of stress and chemical reactions. The most common chemical causing harmful effects is chloride, whether in a solution such as ammonium salts or as subtle a form as hand perspiration. If the rotor is not kept clean and chemicals remain on the rotor, corrosion will result. Also, any moisture left on the rotor for an extended period of time can initiate corrosion. Therefore, it is important that the rotor is thoroughly dried after use.

In general, conditions for corrosion are present in all rotor applications; proper care and maintenance will minimize its effects.

Cleaning and Decontamination

WARNING

These procedures are to be used for general cleaning purposes only. If the rotor or any of its parts are exposed to a contaminant, it must be decontaminated first, then washed.

CAUTION

Do not use strong laboratory detergents to clean the rotor surface. Use the brush supplied in the kit to loosen encrusted material only if necessary; be careful not to scratch the rotor surface.

1. Washing

   Wash the rotor body, buckets, and cap assemblies at least once a week, or ideally, after each use. It is particularly important to wash the rotor immediately after any spills have occurred. Most laboratory chemicals can be removed using the SORVALL® Rotor Cleaning Kit (Catalog No. 92362)

   Rinse the rotor parts well, inside and out, then dry thoroughly with a soft absorbent cloth or an air blast. After drying, apply a film of vacuum grease to the O-rings (Catalog No. 65937).

2. Decontamination

   Ethylene oxide, a 2% glutaraldehyde solution, or ultraviolet radiation are the recommended methods of sterilization; however, the Surespin™630 can be autoclaved at temperatures up to 121°C if all of the parts (including O-rings) are disassembled and separated beforehand. If not separated, parts could deform due to the different properties that the contacting materials may exhibit during the extreme heating and cooling process.

CAUTION

Most commercially available radioactive decontamination solutions are not compatible with titanium or aluminum.

   For general radioactive decontamination, use a solution of equal parts of ethanol, 10% SDS, and water. Follow this with ethanol rinses, then deionized water rinses, and dry with a soft absorbent cloth. Dispose of all wash solutions in proper radioactive waste containers.

Inspection

Periodically, inspect the rotor body, buckets and cap assemblies for signs of stress corrosion, including cracking, abrasions, wear or deformation. If such problems are found, contact Kendro for information on factory inspection or replacement.

Inspect bucket O-rings regularly for cracks, tears or abrasions; replace if necessary, applying a film of vacuum grease (Catalog No. 65937). Occasionally apply a thin film of lubricating grease (Catalog No. 61556) to the fine threads on each bucket cap. This will prevent galling and permit easier cap removal.

Overspeed Decal Replacement

Before replacing the overspeed decal, be sure that the rotor is dry and at room temperature; if it is not, the new decal will not adhere properly.

NOTE Check that the overspeed decal has the correct number of black segments. The Surespin™630 Rotor decal has 30 black segments; if the rotor has been derated to 27 000 rpm, the decal has 33 black segments.

To replace the overspeed decal:

1. Remove the existing overspeed decal from the bottom of the rotor being careful not to scratch the rotor surface.

2. Clean the adhesive from the rotor surface using an adhesive solvent (such as 3M General Adhesive Remover #8984).

3. Wipe the surface dry with a clean, soft cloth.

4. Peel the paper backing off the new overspeed decal, and fit the decal into the recess on the bottom of the rotor. Be sure that the decal is properly centered, then press the decal firmly in place.

Storage

Rinse and dry each bucket, then store them (with caps off) upside down and slightly tilted so air can circulate inside. This helps to prevent moisture from settling in or getting trapped in the buckets.

Service Decontamination Policy

WARNING

Because of the characteristics of the samples likely to be processed in this centrifuge, biological or radioactive contamination may occur. Always be aware of this possibility, and take normal precautions. Use appropriate decontamination procedures should exposure occur.

If a centrifuge or rotor that has been used with radioactive or pathogenic material requires servicing by Kendro personnel, either at the customer's laboratory or at a Kendro facility, comply with the following procedure to ensure the safety of all personnel:

1. Clean the equipment to be serviced of all encrusted material and decontaminate it (see Care and Maintenance section of centrifuge or rotor instruction manual) prior to servicing by the Kendro representative or returning it to the Kendro facility. There must be no radioactivity detectable by survey equipment.

   The SORVALL® Product Guide contains descriptions of commonly used decontamination methods and a chart showing method compatibility with various materials. The Care and Maintenance Section of the centrifuge or rotor instruction manual contains specific guidance about cleaning and decontamination methods appropriate for the product it describes.

   Clean and decontaminate your centrifuge or rotor as follows:

   For ultracentrifuges:
   a. Remove rotor from the rotor chamber.
   b. Decontaminate door and rotor chamber using an appropriate method.

   For rotors:
   Remove tubes, bottles, and adapters from the rotor and decontaminate rotor using an appropriate method. If tubes or rotor caps are stuck in the rotor, or the rotor lid is stuck, notify Kendro representative; be prepared with the name and nature of the sample so the Kendro Chemical Hazards Officer can decide whether to authorize the rotor's return to a Kendro facility.

Do not leave a loaded rotor locked inside a centrifuge that requires servicing. If, with a loaded rotor installed in the chamber, a centrifuge malfunction makes it so that the chamber door will not open by normal means, follow the Emergency Sample Recovery procedure found in your centrifuge operating instructions manual to gain access to the rotor.

2. Complete and attach Decontamination Information Certificate (in the back of your rotor or instrument manual) to the centrifuge or rotor before servicing.

   Decontamination Information Certificates are included with this book. Additional certificates are available from the local Kendro Representative or Field Service Engineer. In the event these certificates are not available, a signed, written statement certifying that the unit has been properly decontaminated, identifying what the contaminants were and outlining the decontamination procedures used will be acceptable.

NOTE The Field Service Engineer will note on the Customer Service Repair Report if decontamination was required and, if so, what the contaminant was and what procedure was used. If no decontamination was required, it will be so stated.

If a centrifuge or rotor to be serviced does not have a Decontamination Information Certificate attached and, in Kendro's opinion presents a potential radioactive or biological hazard, the Kendro representative will not service the equipment until proper decontamination and certification is complete.

If the centrifuge or rotor must be returned to a Kendro facility:

1. Contact your Kendro representative to obtain an Equipment Return Decontamination Form; be prepared with the name and serial number of the centrifuge or rotor and the repairs required.

2. Complete the Equipment Return Decontamination Form and returned it to Kendro. Upon receipt of a completed form, a Returned Material Authorization Number (RMA Number) will be issued to you.

3. With the RMA Number clearly marked on the outside of packaging, send the items to the address obtained from your Kendro representative.

NOTE United States federal regulations require that parts and instruments *must* be decontaminated before being transported. Outside the United States, check local regulations.

C A U T I O N

Do not ship or transport a centrifuge with a rotor installed on the drive spindle. If a centrifuge chamber door cannot be opened using conventional methods, refer to the Emergency Sample Recovery (mechanical override) instructions that are provided in your centrifuge operating manual.

If equipment is received at Kendro facilities without a valid RMA Number on the outside of the shipping container and a completed Equipment Return Decontamination Form on file, the equipment will be treated as a potential contamination hazard, and will not be serviced until decontamination certification has been completed. The sender will be contacted for instructions regarding disposition of the equipment in question; all disposition costs will be borne by the sender. If contaminated equipment is received at Kendro facilities, both the carrier and appropriate authorities shall be notified.

APPENDIX

Chemical Compatibility Chart

Page 1 of 4:
Chemicals
A** through **Ch

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*, POLYCLEAR™, CLEARCRIMP™	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYETHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®
Acetaldehyde	S	–	U	U	–	–	–	M	–	U	–	–	–	M	U	U	U	M	M	–	M	S	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	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
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
Acetone	M	S	U	U	S	U	M	S	S	U	U	S	U	S	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	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	U
Allyl Alcohol	–	–	–	U	–	–	S	–	–	–	–	S	–	S	S	M	S	S	S	–	M	S	–	–	S	–	–
Aluminum Chloride	U	U	S	S	S	S	U	S	S	S	S	M	S	S	S	S	–	S	S	S	S	S	M	U	U	S	S
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
Ammonium Carbonate	M	S	U	S	S	S	S	S	S	S	S	S	S	S	U	U	–	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	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	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	–	U
Ammonium Phosphate	U	–	S	–	S	S	S	S	S	S	S	S	–	S	S	M	–	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	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
Aqua Regia	U	–	U	U	–	–	U	–	–	–	–	–	U	U	U	U	U	U	U	–	–	–	–	–	S	–	M
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
Benzene	S	S	U	U	S	U	M	U	S	U	U	S	U	U	U	M	U	M	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	U	S	S	S	S	S	S	S	S	S	S
N-Butyl Alcohol	S	–	S	U	–	–	S	–	–	S	M	–	U	S	M	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
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
Calcium Hypochlorite	M	–	U	–	S	M	M	S	–	M	–	S	–	S	M	S	–	S	S	S	M	S	M	U	S	–	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	U	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
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
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
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
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
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
Chloroform	U	U	U	U	S	S	M	U	S	U	U	M	U	M	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

* Polyethyleneterephthalate

NOTE 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 of sample lots.

KEY S = Satisfactory
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 = Unsatisfactory, not recommended.
— = Performance unknown; suggest testing, using sample to avoid loss of valuable material.

Chemical Compatibility Chart

Page 2 of 4:
Chemicals
Ch** through **Io

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*, POLYCLEAR™, CLEARCRIMP™	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYETHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®
Chromic Acid (50%)	U	–	U	U	–	U	U	–	–	–	S	U	U	S	M	U	M	S	S	U	M	S	–	U	M	–	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
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
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
Diethyl Ether	S	S	U	U	S	S	S	U	S	U	U	S	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
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
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
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
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
Ethyl Alcohol (50%)	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	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	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
Ferric Chloride	U	U	S	–	–	–	M	S	–	M	–	S	–	S	–	–	–	S	S	–	–	–	M	U	S	–	S
Ficoll-Hypaque®	M	S	S	–	S	S	S	–	S	S	S	S	–	S	S	–	S	S	S	S	S	S	S	M	S	S	S
Formaldehyde (40%)	M	M	M	S	S	S	S	M	S	S	S	S	M	S	S	S	U	S	S	M	S	S	S	M	S	M	U
Formic Acid (100%)	–	S	M	U	–	–	U	–	–	–	–	U	–	S	M	U	U	S	S	–	U	S	–	U	S	–	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
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
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
Hydrochloric Acid (10%)	U	U	M	S	S	S	U	–	S	S	S	U	U	S	U	S	S	S	S	S	S	S	S	U	M	S	S
Hydrochloric Acid (50%)	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
Hydrochloric Acid (conc.)	U	U	U	U	–	U	U	M	–	U	M	U	U	M	U	U	U	–	S	–	U	S	U	U	U	–	–
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
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	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
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

* Polyethyleneterephthalate

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KEY S = Satisfactory
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Chemical Compatibility Chart

Page 3 of 4: Chemicals Is** through **Ru

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*, POLYCLEAR™, CLEARCRIMP™	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYETHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®
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	S	U	S	S	U	S	U	M	S	S	S	S	S	S	S	M	M	M	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
Lactic Acid (20%)	–	–	S	S	–	–	–	–	–	M	S	M	–	S	S	S	S	S	S	S	M	S	M	S	S	–	S
Lactic Acid (100%)	–	–	S	–	–	–	–	–	–	M	S	U	–	S	S	S	M	S	S	–	M	S	M	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	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
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
Metrizamide®	M	S	S	–	S	S	S	–	S	S	S	S	–	S	S	–	–	S	S	S	S	S	S	M	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	M	S	M	U
Methyl Ethyl Ketone	S	S	U	U	S	S	M	S	S	U	U	S	U	S	U	U	U	S	S	U	U	S	S	S	S	U	U
Methylene Chloride	U	U	U	U	M	S	S	U	S	U	U	S	U	U	U	U	U	M	U	U	U	S	S	M	U	S	U
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
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
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	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	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	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
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
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

* Polyethyleneterephthalate

NOTE 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 of sample lots.

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Chemical Compatibility Chart

Page 4 of 4: Chemicals Ru** through **Z

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*, POLYCLEAR™, CLEARCRIMP™	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYETHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®
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
Sodium Borate	M	S	S	S	S	S	S	S	S	S	S	U	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	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
Sodium Chloride (10%)	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
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
Sodium Hydroxide (<1%)	U	–	M	S	S	S	–	–	S	M	S	S	–	S	M	M	S	S	S	S	S	S	M	S	S	–	U
Sodium Hydroxide (10%)	U	–	M	U	–	–	U	–	M	M	S	S	U	S	U	U	S	S	S	S	S	S	M	S	S	–	U
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
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
Stearic Acid	S	–	S	–	–	–	S	M	S	S	S	S	–	S	S	S	S	S	S	S	S	S	M	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	S	U	S	S	S
Sulfuric Acid (10%)	M	U	U	S	S	U	U	–	S	S	M	U	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	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
Solution 555 (20%)	S	S	S	–	–	–	S	–	S	S	S	S	S	S	S	–	–	S	S	S	–	S	S	S	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
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
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
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
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

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Warranty

Kendro Laboratory Products makes no warranty of any kind, expressed or implied, except as stated in this warranty policy.

SORVALL® Titanium Swinging Bucket Ultracentrifuge Rotors are warranted against defects in material and workmanship, subject to the conditions stated below and in the Kendro terms and conditions of sale in effect at the time of sale, for 1000 runs at any speed up to the maximum speed indicated on the rotor body. The warranty is then extended to an additional 1000 runs at any speed to a maximum of 90% of that indicated on the rotor body.

Conditions

a. This warranty is valid for five (5) years from the date of shipment to the original buyer by Kendro or an authorized Kendro Representative.

b. This warranty extends only to the original Buyer and may not be assigned or extended to a third person without the written consent of Kendro.

c. This warranty covers the rotor only and Kendro shall not be liable for damage to accessories or ancillary supplies including but not limited to (i) tubes, (ii) tube caps, (iii) tube adapters, or (iv) tube contents.

d. This warranty is void if the rotor is (i) operated or maintained in a manner contrary to the instructions in the manual for the rotor or ultracentrifuge in use, or (ii) used in a SORVALL® Ultracentrifuge that has been modified without the written permission of Kendro.

e. Warranty is void unless rotor speed is properly reduced for certain fluid densities, gradients, tube assemblies, and adapters as described in these instructions.

f. Should a SORVALL® Ultracentrifuge be damaged due to the failure of a rotor covered by this warranty, Kendro will supply, free of charge (i) all ultracentrifuge parts required for repair and (ii) if the ultracentrifuge is currently covered by a Kendro warranty or service agreement, all labor necessary for repair of the ultracentrifuge.

g. Rotor bucket sets purchased or obtained concurrently, or subsequent to, the purchase or obtaining of a swinging bucket rotor are warranted only for a period coincidental with that of the rotor for which the buckets are used.

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, their design, suitability for use, installation or operation. Kendro will in no event be liable for any special or consequential damages whatsoever, and our liability under no circumstances will exceed the contract price for the goods for which liability is claimed.

Index

NOTES

DECONTAMINATION INFORMATION CERTIFICATE

Complete and attach to equipment *BEFORE* servicing *(instructions on reverse)*

PLEASE PRINT

DECONTAMINATION CERTIFIED BY _____ TITLE/POSITION _____

PHONE _____ FAX _____ DEPARTMENT _____

INSTITUTION _____ ADDRESS _____

CITY _____ STATE _____ ZIP _____

INSTRUMENT _____ SERIAL NUMBER _____

ROTOR _____ SERIAL NUMBER _____

PART _____ PART NUMBER _____

HAZARDOUS CONTAMINANT(S) _____ DECONTAMINATION DATE _____

DECONTAMINATION METHOD(S) _____

DECONTAMINATION CERTIFIER'S SIGNATURE _____ DATE _____

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INSTRUCTIONS

When an instrument that has been used with radioactive, pathogenic, or otherwise hazardous materials requires servicing by Kendro personnel either at the customer's laboratory or at Kendro facilities, the following procedure must be complied with to insure safety of our personnel:

1. The instrument or part to be serviced shall be cleaned of all blood and other encrusted material and decontaminated prior to servicing by our representative. No radioactivity shall be detectable by survey equipment.

2. A Decontamination Information Certificate shall be completed and attached to the instrument or part.

If an instrument or part to be serviced does not have a Decontamination Information Certificate attached to it, and, in our opinion, presents a potential radioactive or biological hazard, our representative will not service the equipment until proper decontamination and certification has been completed. If an instrument is received at our Service facilities and, in our opinion, poses a radioactive or biological hazard, the sender will be contacted for instructions as to disposition of the equipment. Disposition costs will be borne by the sender.

Decontamination Information Certificates are included with these Operation Instructions. Additional certificates are available from your local technical or customer service representative. In the event these certificates are not available, a written statement certifying that the instrument or part has been properly decontaminated and outlining the procedures used will be acceptable.

NOTE Kendro Service representatives will indicate on a Customer Service Repair Report if decontamination was required, and if so, what the contaminate was and what procedure was used. If no decontamination was required, it should be so stated.

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AUSTRIA
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