Thermo Fisher Scientific

T-1250

Instruction Manual

11718-5 March 2010

Release history: 11718-5 printed in March 2010.

For Research Use Only. Not for use in diagnostic procedures.

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This manual is a guide for the use of

Thermo Scientific T-1250 Titanium Fixed-Angle Ultracentrifuge Rotor

Data herein has been verified and is believed adequate for the intended use of the centrifuge. 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. Thermo Scientific 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 may contain data in apparent conflict with that provided herein. Please consider all data in this manual to be the most current.

NOTES, CAUTIONS, and WARNINGS within the text of this manual are used to emphasize important and critical instructions.

WARNING informs the operator of a hazard or 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 near the information they correspond to.

Important Safety Information

Certain potentially dangerous conditions are inherent to the use of all centrifuge 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 load 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 drive assembly.

Do not operate the rotor without the cover in position and locked to the centrifuge drive. 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, Care and Maintenance.

Do not autoclave the aluminum rotor cover or locking nut to temperatures in excess of 100°C.

DESCRIPTION

This manual contains information required to operate and maintain the Thermo Scientific T-1250 Fixed-Angle Ultracentrifuge Rotor. If you require additional information regarding operation or maintenance, please contact Thermo Scientific for assistance. In the United States, call Thermo toll-free 1-866-9THERMO; outside the United States, contact the nearest Thermo Scientific office (see back cover) or your local representative for Thermo Fisher Scientific products. Thermo Fisher Scientific product information is available on our internet web site at http://www.thermo.com/rotors .

Contents

Rotor Description

The T-1250 is a twelve-place, fixed-angle, ultracentrifuge rotor that can be used at speeds up to 50,000 rpm.[1] The rotor body is made from a titanium forging for strength and corrosion resistance. The aluminum lid and locking nut are given a blue anodized finish for surface protection. The rotor is tightly sealed during operation by two O-rings, one that fits inside the rotor lid and another around the bottom of the locking nut. The twelve tube compartments are bored at a 24° angle to the axis of rotation. A disc with alternative black and reflective segments attached to the bottom of the rotor provides overspeed protection.

Rotor Specifications

Table 1-1. Rotor Specifications

Rotor Type	Fixed Angle
Maximum Speed (rpm)	50, 000[*]
Relative Centrifugal Force (RCF) at Max. Speed at $r_{maximum}$ 10.78 cm at $r_{average}$ 8.125 cm at $r_{minimum}$ 5.47 cm	 301 032 226 891 152 750
K Factor at Maximum Speed	68.7
Critical Speed (rpm)	3500
in an OTD-B, OTD-Combi, Ultra 80®, Combi PLUS and ULTRA PRO® 80 in an RC-60/70/80	700 rpm 500 rpm
Tube Size (mm)	25 mm x 97 mm
Number of Compartments	12
Capacity per Compartment (Nominal)	35 ml
Total Rotor Capacity (Nominal)	420 ml
Maximum Compartment Mass	66 g
Tube Angle	24°
Rotor Diameter	25.5 cm (8.87 inches)
Rotor Weight (Mass)	11.08 kg (24.4 lbs)

[*] With tubes filled with a non-precipitating homogenous solution having an average density of 1.2 g/ml or less.

[1] 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 to speed in this manual will be designated as rpm.

Accessories

a. Accessories Supplied

The accessories supplied with the T-1250 Rotor, Catalog No. 1717 (rotor with complete accessories), are listed in Table 1-2. Those items indicated by an asterisk (*) are not supplied with Catalog No. 11713, which is a T-1250 Rotor with basic accessories only.

Note In order to seal the ULTRACRIMP® Tubes (supplied with Catalog No. 11717), you must have an ULTRACRIMP® Sealing Tool, Catalog No. 03920.

To order replacement accessories, telephone (800) 522-SPIN (800 522-7746) in the United States. Outside the United States, contact your Thermo Fisher Scientific products distributor or agent. Be sure to provide a description of the part, the catalog number, plus the rotor model and serial number.

Table 1-2. Accessories Supplied

Quantity	Catalog Number	Description
8	03989*	ULTRACRIMP® Tubes, 35 ml (Pkg/25)**
12	03996*	Rotor Cap
1	03935*	Tube Racks, 4-place (1 pair)
1	12826*	Tube Removal Tool
1	52392	Rotor Cover Tool
1	51942	Rotor Stand
1	65837	Vacuum Grease
1	61556	Lubricant
1	51349	Overspeed Decal, 50 000 rpm (extra)
1	11549	Rotor Cover O-ring, Viton® (extra)
1	11550	Locking Nut O-ring, Rotor Cover Assembly, Viton® (extra)
1	52384	Centrifuge/Rotor Log Book
1	11718	Instruction Manual

* Not supplied with Catalog No. 11713 (rotor with basic accessories only).

** Each package of tubes is supplied with an equal number of tube caps and tube plugs.

b. Optional Multipiece Sealing Assembly

If you prefer, you can use the T-1250 Rotor with thinwall polyallomer tubes and titanium sealing assemblies. To do so, you must purchase all items separately: the T-1250 Rotor with basic accessories only, Catalog No. 11713; a Tool Kit, Catalog No. 12891; the tubes; and sealing assemblies. Table 1-3 lists the catalog number and description of the tubes and sealing assembly required, and Table 1-4 lists the parts supplied in the Tool Kit. If you have any of the tools listed, you do not need to purchase the kit; if necessary, any of the tools listed can be ordered separately by the catalog number given in the table.

Table 1-3. Optional Multipiece Sealing Assembly Components

Catalog Number	Description
03141	Tubes, 36 ml, Polyallomer (25/pkg)
52572	Sealing Cap Assembly (each); 12 required

Table 1-4. Tool Kit Parts List for use with Optional Multipiece Sealing Assembly (Catalog No. 12891)

Catalog Number	Description
51834	Tube Cap Vise
52013	Tube Removal Tool
52881	Torque Wrench
11540	Socket, 3/4

OPERATION

This chapter contains the information necessary to prepare the T-1250 Rotor for operation and includes important safety information.

Contents

Prerun Safety Checks

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

- read the Important Safety Information on page iii.

> **WARNING**
>
> The stresses that this rotor withstands during centrifugation eventually cause the rotor body to weaken, increasing the possibility of rotor failure. For your safety, we recommend that this rotor be withdrawn from service after it has been used for 5000 runs. Failure to do so can cause rotor failure with subsequent sample loss and damage to the rotor and/or centrifuge. If the material being processed is hazardous, the loss of sample can result in personal injury.

- make sure each tube compartment is clean and that there is no sign of corrosion.
- be sure the rotor itself is clean and shows no sign of corrosion or cracking. Also, make sure there are no scratches or burrs around the rim of the rotor.
- check the centrifuge chamber and drive spindle to be sure they are clean and free of scratches and burrs.
- verify that the proper overspeed decal is firmly attached to the bottom of the rotor; the decal must have 18 black segments (refer to page 3-4 for Overspeed Decal Replacement procedure).
- check the chemical compatibility of all materials used (see Table in Appendix A).
- inspect the rotor cover O-rings for cracks, tears, or abrasions and replace if necessary. Be sure the O-rings are properly lubricated (see page 2-9).
- make sure that the rotor cover is on and properly tightened.
- check the top speed capability of the tube or bottle being used; observe the CAUTION.

> **CAUTION**
>
> When using tubes (or bottles) other than those supplied by Thermo Fisher Scientific, be sure to check the top speed capability; when in doubt, do a test run for the desired application. If using a Thermo Fisher Scientific tube (or bottle) other than those supplied with this rotor, refer to the Product Guide for the maximum speed. Exceeding the top speed capability of the tube (or bottle) can result in its breakage.

Compartment Loads in Excess of Design Mass

The maximum run speed (50 000 rpm) is based on the recommended design mass has been established for each ultracentrifuge rotor, representing the maximum mass that each tube compartment can contain during operation. To prevent rotor failure, the total contents, including specimen, tube, rotor cap, tube cap, and tube plug, should not exceed the figure given unless rotor speed is reduced proportionately. (If using the optional multipiece sealing assembly, include the weight of the complete assembly.)

Strict adherence to the maximum allowable compartment mass or reduced speed is required to prevent rotor failure.

WARNING

Always reduce (derate) rotor speed as instructed in this manual whenever the compartment load exceeds the maximum allowable compartment load specified. Failure to reduce rotor speed under these conditions can cause rotor failure.

The design mass for each compartment of the T-1250 Rotor is 66 g at 50 000 rpm. This figure is based on the use of a thinwall polyallomer tube filled with a liquid at 1.2 specific gravity, plus all sealing assembly components.

If the compartment mass is greater than 66 g, use the following formula to determine the reduced speed:

$$\text{Reduced Speed} = 50000\sqrt{\frac{66\text{g}}{\text{actual weight}}}$$

Critical Speed

CAUTION

Do not operate or precool a rotor at the critical speed, as this 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, the rotor and the centrifuge drive). At this speed, the rotor may produce large amplitude vibrations that can be felt in the centrifuge frame. Mass imbalance contributes to increased vibration intensity at the critical speed. Avoid operating the rotor at the critical speed, which is approximately 700 rpm in the OTD-B, OTD-Combi, ULTRA 80® , Combi PLUS and ULTRA PRO® 80 Ultraspeed Centrifuges and 500 rpm in the RC-60/70/80 Ultraspeed Centrifuges. Operation at the critical speed will have a detrimental effect on centrifuge component life.

Rotor Precool

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 can be precooled easily in a Thermo Fisher Scientific Ultracentrifuge. Refer to the Ultracentrifuge Instruction Manual for precooling directions. Be careful not to precool the rotor at its critical speed (read paragraph above).

Relative Centrifugal Force (RCF) Determination

Relative Centrifugal Force (RCF) refers to the force produced 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:

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

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

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

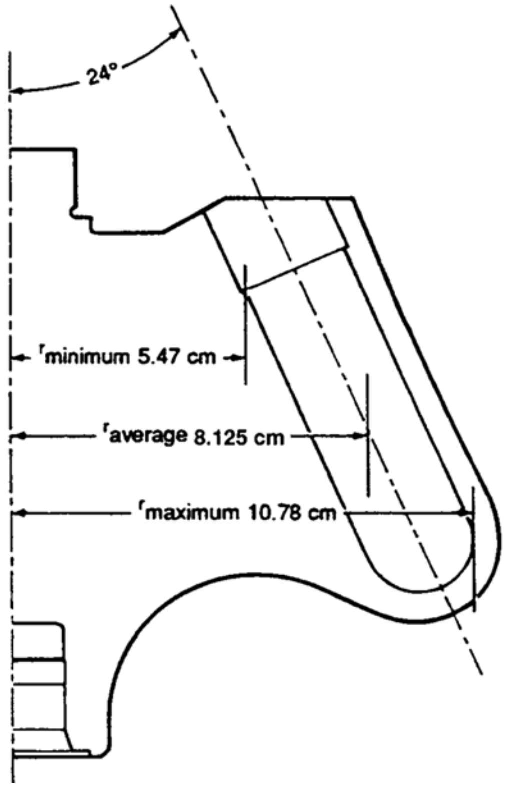

Figure 2-1. T-1250 Rotor Radii

Figure 2-1 shows the minimum, average, and maximum radii of the T-1250 Rotor. Table 2-1 gives the RCF value at each radius at speeds from 20 000 rpm to 50 000 rpm in increments of 500 rpm. The RCF value at any other speed can be calculated by using the above RCF formula.

Table 2-1. T-1270: RCF Values and K Factors*

Speed (rpm)	RCF $r_{max.}$ 8.20 cm	$r_{avg.}$ 6.13 cm	$r_{min.}$ 4.06 cm	K Factors
20,000	48 165	36 303	24 440	429
20,500	50 603	38 140	25 677	408
21,000	53 102	40 024	26 945	389
21,500	55 661	41 952	28 243	371
22,000	58 280	43 926	29 572	355
22,500	60 959	45 945	30 932	339
23,000	63 698	48 010	32 322	324
23,500	66 498	50 120	33 742	311
24,000	69 358	52 276	35 194	298
24,500	72 278	54 476	36 675	286

Table 2-1. T-1270: RCF Values and K Factors*

Speed (rpm)	RCF $r_{max.}$ 8.20 cm	$r_{avg.}$ 6.13 cm	$r_{min.}$ 4.06 cm	K Factors
25,000	75 258	56 723	38 187	275
25,500	78 298	59 014	39 730	264
26,000	81 399	61 351	41 304	254
26,500	84 560	63 734	42 907	244
27,000	87 781	66 161	44 542	235
27,500	91 062	68 634	46 207	227
28,000	94 403	71 153	47 902	219
28,500	97 805	73 717	49 628	211
29,000	101 267	76 326	51 385	204
29,500	104 789	78 981	53 172	197
30,000	108 371	81 681	54 990	191
30,500	112 014	84 426	56 838	185
31,000	115 717	87 217	58 717	179
31,500	119 479	90 053	60 626	173
32,000	123 303	92 934	62 566	168
32,500	127 186	95 861	64 537	162
33,000	131 129	98 834	66 538	158
33,500	135 133	101 851	68 569	153
34,000	139 197	104 914	70 631	148
34,500	143 321	108 023	72 724	144
35,000	147 505	111 176	74 847	140
35,500	151 749	114 376	77 001	136
36,000	156 035	117 620	79 185	132
36,500	160 420	120 910	81 400	129
37,000	164 845	124 245	83 646	125
37,500	169 330	127 626	85 922	122
38,000	173 876	131 052	88 228	119
38,500	178 482	134 523	90 565	116
39,000	183 148	138 040	92 933	113
39,500	187 874	141 602	95 331	110
40,000	192 660	145 210	97 760	107
40,500	197 507	148 863	100219	105
41,000	202 414	152 561	102 709	102
41,500	207 381	156 305	105 229	99.7
42,000	212 408	160 094	107 780	97.3

Table 2-1. T-1270: RCF Values and K Factors*

Speed (rpm)	RCF $r_{max.}$ 8.20 cm	$r_{avg.}$ 6.13 cm	$r_{min.}$ 4.06 cm	K Factors
42,500	217 495	163 928	110 362	95.0
43,000	222 643	167 808	112 974	92.8
43,500	227 851	171 734	115 616	90.7
44,000	233 119	175 704	118 289	88.7
44,500	238 447	179 720	120 993	86.7
45,000	243 836	183 781	123 727	84.8
45,500	249 284	187 888	126 492	82.9
46,000	254 793	192 040	129 287	81.1
46,500	260 362	196 238	132 113	79.4
47,000	265 991	200 991	134 970	77.7
47,500	271 681	204 769	137 857	76.1
48,000	277 431	209 102	140 774	74.5
48,500	283 241	213 481	143 722	73.0
49,000	289 111	217 906	146 701	71.5
49,500	295 041	222 376	149 710	70.0
50,000	301 032	226 891	152 750	68.7

*Values are based on rotor compartment specifications; they do not take thickness of tube into consideration.

Calculation of Sedimentation Time 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 calculated using the equation:

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

where:

t = sedimentation time in hours

K = the clearing factor for the rotor (defined on the next page)

S_{20}, w = the sedimentation coefficient for the particle of interest in water at 20°C as expressed in Svedbergs[1]

[1] The sedimentation coefficient (S) in seconds, for a particle in a centrifugal field is defined by the equation S = (dx/dt) [1/(ω^2x)]; 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.

The clearing (or K) factor is defined by the equation:

$$K = (253000)\left[\text{In}\left(\frac{r_{maximum}}{r_{minimum}}\right)\right] \div \left(\frac{\text{rotor speed}}{1000}\right)^2$$

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 T-1250 Rotor, at speeds from 20,000 rpm to 50,000 rpm (in increments of 500 rpm), are listed in Table 2-1.

Example: The T-1250 Rotor has a K factor of 68.7 at the maximum permitted speed (50,000 rpm). If the particles to be sedimented have a sedimentation coefficient of 10S, the estimated run time required at maximum speed will be:

$$t = \frac{68.7}{10S} \; 6.87 \text{ hours} = 6 \text{ hours, } 52 \text{ minutes}$$

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.

Chemical Compatibility

The critical components of the T-1250 Rotor apt to come in contact with solution are: rotor body (titanium), rotor cover assembly (aluminum), rotor cap and tube cap (aluminum), tube plug (Buna N rubber), O-rings (Viton®); and material of the tubes being used.

If using the optional multipiece sealing assembly with the T-1250 Rotor, the sealing assembly components apt to come in contact with solution are: tube plug cover and tube plug (titanium), post-fill being used.

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 to the selection of tube materials. When in doubt, we recommend pretesting of sample lots.

Rotor Balancing

CAUTION

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 drive assembly.

Always balance the rotor according to the following criteria:

a. balance pairs of tubes containing fluid of identical specific gravity to within 0.5 gram and place them in opposite tube compartments.

b. when using less than a full complement of twelve tubes, the rotor can be operated at maximum allowable speed with groups of two, three, four, six, eight, nine or ten samples, provided opposing pairs are positioned as shown in figure 2-2.

c. if one, five, seven, or eleven samples are to be run, balance the load as above with a dummy tube that contains a solution having the same specific gravity as the sample in the opposing rotor compartment.

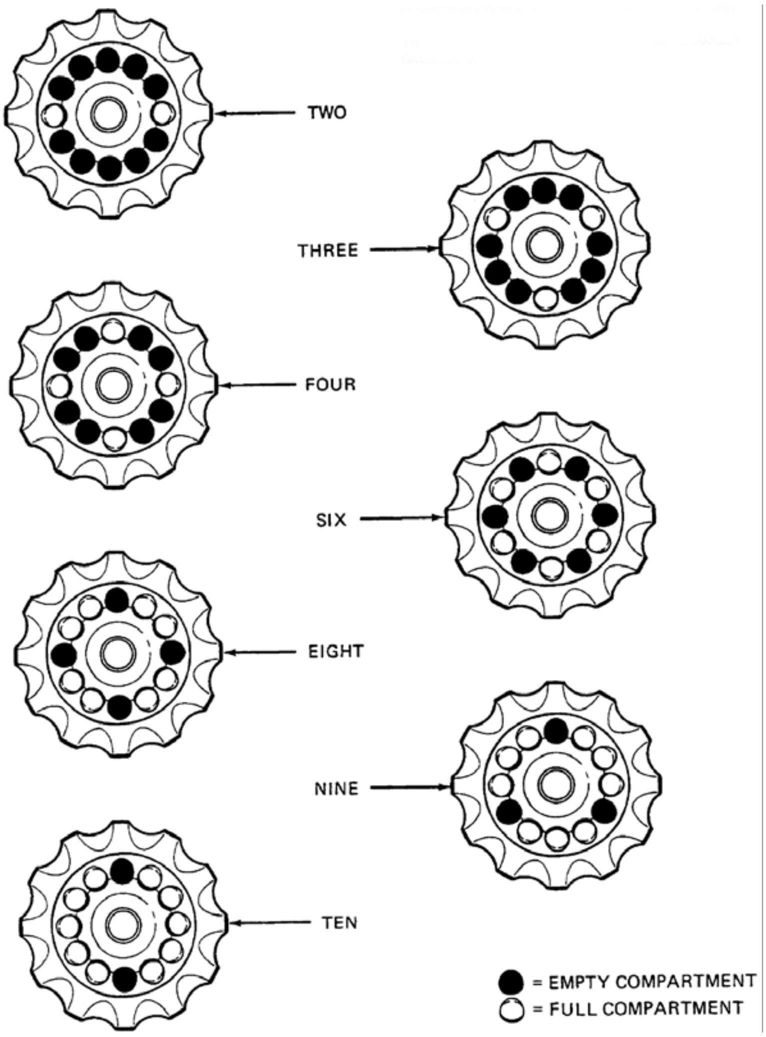

Figure 2-2. Compartment Loading

Note Configurations for balancing three and nine tubes have three unopposed tubes. All threee unopposed tubes must be equally balanced.

Rotor Loading and Sealing

Note If using the optional multipiece sealing assemblies and tubes (Catalog No. 52572 and 03141 respectively), seal the tubes and load them in the rotor according to the instructions shipped with the sealing cap assemblies.

Prepare the ULTRACRIMP® tubes (Catalog No. 03989) for use by following the tube filling and tube sealing procedures given in the ULTRACRIMP® Tube Sealing System instruction manual.

Load and seal the rotor as follows:

1. Gently place filled tubes in the rotor compartments (balancing the rotor as described on page 2-7).

2. Place a rotor cap (Catalog No. 03996) into each rotor compartment that contains a filled tube. Push the rotor cap into the tube compartment until it is properly seated; when properly seated, the edge of the cap will be approximately flush with the top of the outer edge of the tube compartment (see Figure 2-3).

3. Separate the locking nut from the rotor cover, and check the locking nut O-ring and rotor cover O-ring for scuffs, cracks, or breaks. Replace if necessary (see Figure 3-1 for replacement part catalog numbers).

CAUTION

Do not put a rotor cap in empty tube compartments. Rotor caps should only be installed in compartments that contain a filled tube.

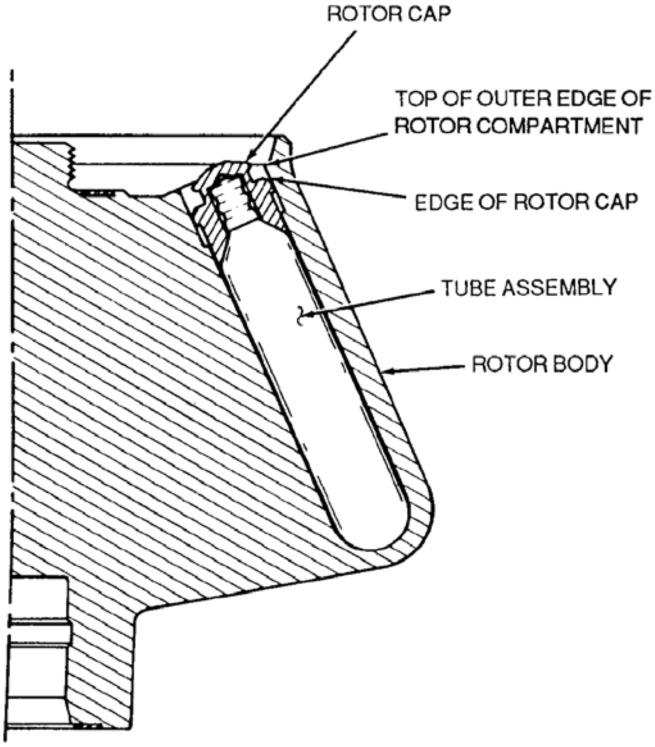

Figure 2-3. Properly Seated Rotor Cap

4. Coat the O-rings lightly with vacuum grease, Catalog No. 65937.

5. Check that the locking nut thread is lightly lubricated with grease, Catalog No. 61556.

6. Place the rotor cover (with O-ring) on the rotor body. Install the locking nut in the rotor cover, then finger tighten the locking nut by turning it clockwise. Insert the rotor cover tool through the locking nut and continue turning the locking nut clockwise until rotor cover is tightened securely. Remove the rotor cover tool from the locking nut.

CAUTION

Rotor cover tool must be removed prior to centrifuge run.

7. Carry rotor carefully, and lower it into the centrifuge chamber slowly and vertically. Be sure rotor snaps in place on the drive adapter. Check that it is properly seated by pulling it gently in an upward direction and noting a small amount of resistance.

Centrifuge Rotor Log

An Ultraspeed Centrifuge/Rotor Log Book is supplied with the T-1250 Rotor so you can easily record all data necessary to meet the warranty stipulation that any defective Ultraspeed Centrifuge Rotor (or Ultracentrifuge) being returned to Thermo Scientific must be accompanied by an up-to-date history of the rotor.

Each time the T-1250 Rotor is run, record the run in the log book as shown in Figure 2-4, Sample Centrifuge/Rotor Log Sheet.

Thermo Scientific Centrifuge and Rotor Log Book					RUN TIME (List by Rotor Used)								This log is for use with one centrifuge ONLY:
					Rotor S/N	AH-629 8731384	Rotor S/N	TV-865 9130129	Rotor S/N	T-1270 8931255	Rotor S/N	T-880 9030040	Model: ULTRA 80 Ser. No.: 9102448
Date	Operator	Rev. Count @ Run Start	TEMP	SPEED	HRS	MIN	HRS	MIN	HRS	MIN	HRS	MIN	Remarks*
09/04/91	J. JONES	00410290	4	57.0			05	30					PLASMID PREP.
09/05/91	B. SMITH	00429100	4	21.0	26	00							SUCROSE GRADIENT
09/07/91	J. JONES	00461860	21	70.0					18	00			LIPOPROTEIN SEP.

Figure 2-4. Sample Centrifuge/Rotor Log Sheet

CARE and MAINTENANCE

This chapter provides instructions on how to clean, decontaminate, and maintain your rotor. Always maintain the rotor in the recommended manner. Do not use rotors that show signs of corrosion or cracking..

Contents

Corrosion

The T-1250 titanium rotor body is more resistant to corrosion than an aluminum rotor body, but it should be maintained and kept clean in the same manner. With proper care, corrosion can be minimized to significantly prolong the life of the rotor and lessen the chances of rotor failure and potential damage to the centrifuge.

Corrosion commonly refers to chemical reactions at the surface (that is, rusting or pitting) recognized by the growing areas of visible deterioration. In addition, 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 and even the corrosion resistant alloys have been found susceptible.

Stress corrosion is thought to be initiated by certain combinations of stress and chemical reaction. The most common chemical causing harmful effects is chloride, whether in a solution (for example, ammonium salts) or as subtle a form as hand perspiration. If the rotor is not kept clean and these 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 to thoroughly wash and dry the rotor after each use.

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

Cleaning and Decontamination

WARNING

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.

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

a. Rotor Body

1. Washing

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.

Always maintain the centrifuge in the recommended manner. The rotor and all accessories must be clean and inspected prior to each run: do not use a rotor showing signs of corrosion or cracking.

Wash the rotor body with warm water and mild soap or detergent 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 with a lukewarm, 1% solution of a mild, non-alkaline detergent such as a mild dishwashing liquid. Rinse the rotor well, inside and out. After rinsing, dry the rotor thoroughly with a soft absorbent cloth or an air blast.

Do not use strong laboratory detergents to clean rotor surface. Use a soft bristle brush to loosen encrusted materials only if necessary; be careful not to scratch the rotor surface.

2. Decontamination

CAUTION

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

Ethylene oxide, a 2% glutaraldehyde solution, or ultraviolet radiation are the recommended methods of sterilization; however, the rotor body of the T-1270 can be autoclaved at temperatures up to 121°C.

For general radioactive decontamination, use a solution of equal parts of 70% 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.

b. Rotor Cover Assembly (Figure 3-1)

CAUTION

Do NOT autoclave the rotor cover or locking nut. If these parts are subjected to a temperature above 100°C, they should not be used.

Wash the rotor cover and locking nut with a mild, non-alkaline detergent; rinse and dry them carefully before storing. Do not autoclave aluminum cover assembly. If required, use gas or chemical sterilization.

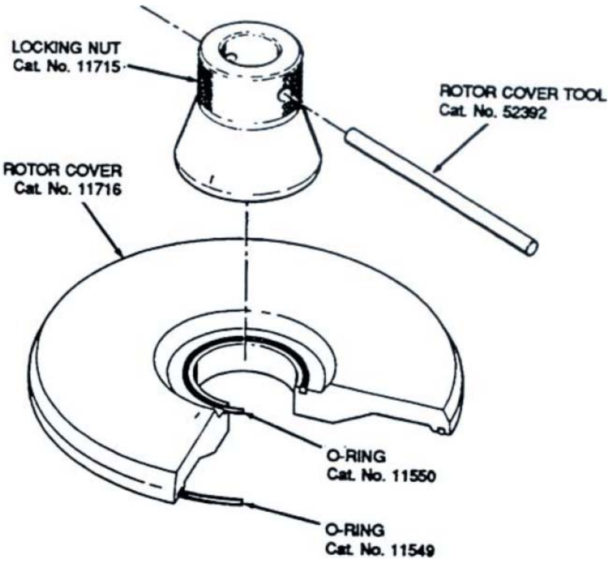

Figure 3-1. Rotor Cover Assembly

c. ULTRACRIMP®Sealing System Components

Autoclaving of the ULTRACRIMP® Sealing Tool and the aluminum rotor caps is not recommended. All parts may be cleaned with a lukewarm, 1% solution of a mild, *non-alkaline* detergent, such as a mild dishwashing liquid. The tube racks can be autoclaved.

d. Optional Multipiece Sealing Assembly Components

1. Before each use:
   - inspect the O-ring for signs of cracks, tears, or abrasions.;
   - inspect the tube plug covers as shown in Figure 3-2;

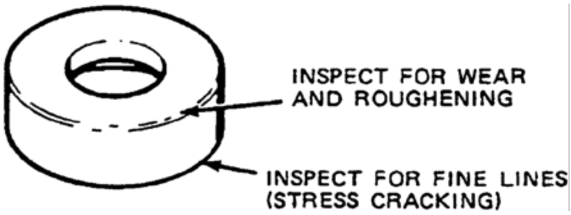

Figure 3-2. Tube Plug Cover Inspection (Optional Multipiece Sealing Assembly)

   - inspect the tube cover as shown in Figure 3-3;

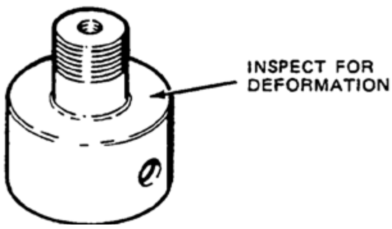

Figure 3-3. Tube Plug Inspection (Optional Multipiece Sealing Assembly)

   - replace O-rings, tube plug covers and/or tube plugs, if necessary.
2. Wash the sealing cap assembly components regularly with a mild, *non-alkaline* detergent; rinse and dry them carefully before storing.

Overspeed Decal Replacement

Before replacing the decal, be sure that the rotor is dry and at room temperature; this ensures that the new decal adheres properly.

To replace the decal:

1. Remove the existing decal from the bottom of the rotor; be careful not to scratch the rotor surface.
2. Clean the adhesive from the rotor surface using acetone or 3M General Adhesive Remover #8984.

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

Note Check that the new decal has the correct number of black segments – the T–1250 Rotor decal should have 18 black segments.

4. Peel the paper backing of the new decal. Fit the decal into the recess in the bottom of the rotor. Be sure the decal is properly centered, then press the decal firmly into place.

Storage

Rotors should be stored upside down, with covers removed, so air can circulate. This will help prevent moisture from gathering and settling at the bottom of the tube compartments.

Service Decontamination Policy

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

1. Clean the centrifuge or rotor to be serviced of all encrusted material and decontaminate (see Maintenance Section of centrifuge or rotor instruction manual) it prior to servicing by the Thermo Fisher Scientific representative or returning it to the Thermo Fisher Scientificfacility. There must be no radioactivity detectable by survey equipment.

   The Thermo Fisher Scientific 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 lowspeed, superspeed, and SUPRAspeed® floor model centrifuges:

   a. Remove rotor from the rotor chamber.
   b. Remove, wash, and decontaminate motor sealing gasket and pad.
   c. Drain line plugs and clean drain line.
   d. Decontaminate lid, rotor chamber, and drive using an appropriate method.
   e. Remove all encrusted material from around the motor and drive assemblies.

   For ultraspeed centrifuges:

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

   For tabletop centrifuges:

   a. Remove rotor from the rotor chamber.
   b. Remove motor sealing gasket and wash with appropriate decontaminant.
   c. Decontaminate cover, bowl, and drive 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 Thermo Fisher Scientific representative; be prepared with the name and nature of the sample so the Thermo Fisher Scientific Chemical Hazards Officer can decide whether to authorize the rotor's return to a Thermo Fisher Scientific facility.

2. Complete and attach Decontamination Information Certificate (in the back of your rotor or instrument manual) to the centrifuge or rotor before servicing or return to Thermo Fisher Scientific facility. If Certificate is not available, attach a written statement verifying decontamination (what was contaminant and what decontamination method was used).

If the centrifuge or rotor must be returned to a Thermo Fisher Scientific facility:

1. Contact your Thermo Fisher Scientific representative to obtain a Return Service Order Number (RSO No.); be prepared with the name and serial number of the centrifuge or rotor and the repairs required.
2. Send item(s) with the RSO No. clearly marked on the outside of packaging to the address obtained from your Thermo Fisher Scientific representative.

Note United States federal regulations require that parts and instruments must be decontaminated before being transported.

If a centrifuge or rotor to be serviced does not have a Decontamination Information Certificate attached and, in Thermo Fisher Scientific's opinion presents a potential radioactive or biological hazard, the Thermo Fisher Scientific representative will not service the equipment until proper decontamination and certification is complete. If Thermo Fisher Scientific receives a centrifuge or rotor at its Service facilities which, in its opinion, is 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 instructions. Additional certificates are available from the local Account or Field Service Engineer. In the event these certificates are not available, a written statement certifying that the unit has been properly decontaminated and outlining the 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.

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*, POLYCLEAR®, CLEARCRIMP®CCCLEARCRIMP®	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYTHERMIDE	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
Acetaldehyde	S	-	U	U	-	-	-	M	-	U	-	-	-	M	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	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
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
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
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
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

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®CCCLEARCRIMP®	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYTHERMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®
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
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
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
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
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	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
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
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

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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	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
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
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
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
Calcium Hypochlorite	M	-	U	-	S	M	M	S	-	M	-	S	-	S	M	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	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	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
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
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
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

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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
Metrizamide®	M	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	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	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 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 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
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	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

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® CCCLEARCRIMP®	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYTHERMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®
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	S	U	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	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
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
Stearic Acid	S	-	S	-	-	-	S	M	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	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

*Polyethyleneterephthalate

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 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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