Thermo Fisher Scientific

T-8100

Instruction Manual

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

Table of contents

This manual is a guide for the use of

Thermo Scientific T-8100 Fixed-Angle 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. Thermo Fisher 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, e.g., 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. 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.

Rotors with covers must not be operated without the cover in position and locked in place.

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

Do not autoclave the aluminum rotor cover or expose any aluminum rotor parts to temperatures in excess of 100°C.

DESCRIPTION

This manual provides you with the information you will need to operate and maintain your Thermo Scientific T-8100 Fixed-Angle Ultracentrifuge Rotor. If you encounter any problem concerning either operation or maintenance that is not covered in the manual, telephone Thermo Fisher Scientific for assistance. In the United States, telephone toll free 1-866-9THERMO. Outside the United States, contact your distributor or agent for Thermo Fisher Scientific products. Thermo Fisher Scientific product information is available on our internet web site at http:// www.thermo.com/rotors .

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Rotor Description

The T-8100 is an 8-place fixed-angle rotor that can be used at speeds up to 100,000 rpm.[1] The rotor body is machined from titanium for strength and corrosion resistance. 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 eight tube compartments are made at a 26° angle to the axis of rotation. A disc with alternative black and reflective segments on the bottom of the rotor provides overspeed protection.

Rotor Specifications

Table 1-1. Rotor Specifications

Rotor Type	Fixed Angle
Maximum Speed (rpm)	100, 000*
Relative Centrifugal Force (RCF) at Max. Speed at $r_{maximum}$ 7.18 cm at $r_{average}$ 5.37 cm at $r_{minimum}$ 3.56 cm	 802,006 599,829 397,652
K Factor at Maximum Speed	17.7
Critical Speed (rpm)	270
Maximum Tube Size (mm)	13 x 64
Total Rotor Capacity (Nominal) - using 6.5 ml	52 ml
Maximum Tube Compartment Mass	15.2 g
Tube Angle	26°
Rotor Diameter	15.1 cm (5.9 in)
Rotor Weight (Mass)	3.7 kg (8.2 lbs)

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

Accessories

Accessories Supplied

The accessories supplied with the T-8100 Rotor, Catalog No. 45621 (rotor and accessories), are listed in Table 1-2.

[1] Speed in revolutions per minute (rpm) is related to angular velocity, w, according to the following:

$$\omega = (rpm)$$

$$\left\langle\frac{2\pi}{60}\right\rangle = (rpm)(0,10472)$$

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

> **Note** In order to seal the ULTRACRIMP® tubes (supplied with Catalog No. 45621) you must have an ULTRACRIMP® Sealing Tool, Catalog No. 03920.

To order replacement accessories, telephone 1-866-9THERMO in the United States. Outside the United States, contact the local representative, distributor or agent for Thermo Fisher Scientific products. Be sure to provide the catalog number and description of the part included in Table 1-2, plus the rotor model and serial number.

Table 1-2. Accessories Supplied with the T-8100 Rotor

Qty.	Catalog No.	Description
1	51942	Rotor Stand
1	65937	Vacuum Grease
1	61556	Lubricant
1	45659	Overspeed Decal, 100 000 rpm (extra)
2	45657	Rotor Cover O-ring, Viton® (extra)
2	45658	Locking Nut O-ring, Viton® (extra)
1	52392	Rotor Cover Tool
1	52384	Centrifuge/Rotor Log Book
1	45623	Instruction Manual

Table 1-3. Accessories Supplied with the T-8100 Rotor

Qty.	Catalog No.	Description
4	03945*	ULTRACRIMP® Tubes, Polyallomer, 6.0 ml (50/PKG)**
8	45662*	Rotor Cap
1	03921*	Tube Racks, 4-place (1 pair)
1	12826*	ULTRACRIMP® Tube Removal Tool
1	51942	Rotor Stand
1	65937	Vacuum Grease
1	61556	Lubricant
1	45659	Overspeed Decal, 100 000 rpm (extra)
2	45657	Rotor Cover O-ring, Viton® (extra)
2	45658	Loking Nut O-ring Viton® (extra)
1	52392	Rotor Cover Tool
1	52384	Centrifuge/Rotor Log Book
1	45623	Instruction Manual

* Not supplied with Catalog No. 45621 (basic accessories only).

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

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OPERATION

This chapter contains the information necessary to prepare the T-8100 Ultraspeed Rotor for operation and includes important safety information.

Contents

Prerun Safety Checks

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

WARNING The stresses that this rotor withstands during centrifugation gradually weaken the rotor body, increasing the possibility of rotor failure. Thermo Fisher Scientific warranties this rotor for the expected life of the product; and, for your safety, recommends that this rotor be withdrawn from service after it has been used for 5,000 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, take all necessary precautions to prevent exposure should rotor failure occur.

a. read the Safety Information Page in the front of this manual.

b. make sure each tube compartment is clean and that there is no sign of corrosion.

c. 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.

d. check the centrifuge chamber and drive spindle to be sure they are clean and free of scratches and burrs.

e. verify that proper overspeed decal is firmly attached to bottom of rotor; decal should have 9 black segments (see page 3-3 for Overspeed Decal Replacement).

f. check the chemical compatibility of all materials used (see Appendix A).

g. inspect the rotor cover O-rings for cracks, tears, or abrasions; replace if necessary. Be sure the O-rings are properly lubricated.

h. make sure the rotor cover is on and properly tightened and that the rotor cover tool has been removed from the locking nut.

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

j. check the top speed capability of the tube (or bottle) being used; observe the CAUTION.

CAUTION When using a tube or bottle assembly 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) assembly other than those supplied with the rotor, refer to the Thermo Fisher Scientific 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 operating speed (see Specifications, page 1-2) is based on the recommended design mass that has been established for this rotor, representing the maximum mass that each tube compartment can contain at top speed. To prevent rotor failure, the total contents of each compartment (including specimen, tube, rotor cap, tube cap, and tube plug) should not exceed the recommended figure unless the rotor speed is reduced proportionately. (If using optional 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. Observe the WARNING.

WARNING Always reduce (derate) rotor speed whenever the compartment load exceeds the maximum allowable compartment load specified, or the average fluid density is greater than 1.7 g/ml. Failure to reduce rotor speed under these conditions can cause rotor failure.

The design mass for each compartment of the T-8100 Rotor is 15.2 g at 100,000 rpm. This figure is based on the use of a thinwall polyallomer tube filled with a liquid at 1.7 specific gravity, plus all sealing assembly components. If the total compartment mass is greater than that figure, use the following formula to determine the reduced speed:

$$\text{Reduced Speed} = \text{Maximum Speed}\sqrt{\frac{\text{Max. Compartment Mass}}{\text{Actual Weight (g)}}}$$

Critical Speed

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 which can be felt in the centrifuge frame. Mass imbalance will contribute to increased vibration intensity at critical speed. Avoid operating rotor at critical speed (see page 1-2). Operation at the critical speed will have a detrimental effect on centrifuge component life. Observe the CAUTION.

CAUTION Do not operate or precool the rotor at the critical speed, as this will have a detrimental effect on centrifuge component life

Rotor Precool

If samples are routinely processed around 4°C or below, the rotor should be stored in a refrigerator or a cold room.

Relative Centrifugal Force (RCF) Determination

Relative centrifugal force (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:

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

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

Figure 2-1 shows the minimum, average, and maximum radii of the T-8100 Rotor. Table 2-1 gives the RCF value at each radius at speeds from 20,000 rpm to maximum speed (in increments of 500 rpm).

The RCF value at any other 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.

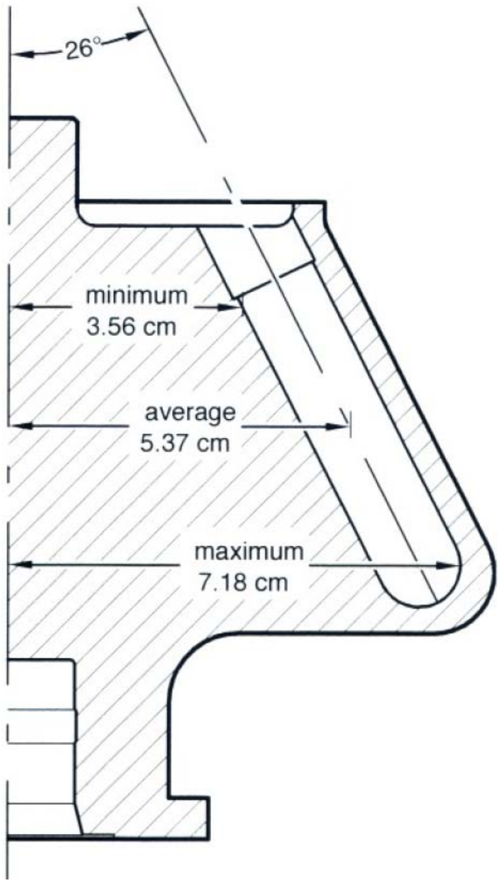

Figure 2-1. Rotor Radii

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

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

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

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 T-8100 Rotor, at speeds from 20,000 rpm to maximum speed (in increments of 500 rpm), are listed in Table 2-1.

Example: The T-8100 Rotor has a K factor of 17.7 at the maximum permitted speed (100,000 rpm). If the particles to be sedimented have a sedimentation coefficient of 10S, the estimated run time required at maximum speed will be:

$$t = \frac{17.7}{10S} \; 1.77 \text{ hours} = 1 \text{ hours, } 46 \text{ minutes}$$

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.

Table 2-4. T-8100 Rotor: RCF Values and K Factors*

	RCF			
Speed (rpm)	**$r_{maximum}$ 7.18 cm**	**$r_{average}$ 5.37 cm**	**$r_{minimum}$ 3.56 cm**	**K Factors**
5,000	2,005	1,500	994	7,100
6,000	2,887	2,159	1,432	4,930
7,000	3,930	2,939	1,948	3,622
8,000	5,133	3,839	2,545	2,773
9,000	6,496	4,859	3,221	2,191
10,000	8,020	5,998	3,977	1,775
11,000	9,704	7,258	4,812	1,467
12,000	11,549	8,638	5,726	1,233
13,000	13,554	1,137	6,720	1,050
14,000	15,719	11,757	7,794	906
15,000	18,045	13,496	8,947	789
16,000	20,531	15,356	10,180	693
17,000	23,178	17,335	11,492	614
18,000	25,985	19,434	12,884	548
19,000	28,952	21,654	14,355	492
20,000	32,080	23,993	15,906	444

[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.

Table 2-4. T-8100 Rotor: RCF Values and K Factors*

	RCF			
Speed (rpm)	$r_{maximum}$ 7.18 cm	$r_{average}$ 5.37 cm	$r_{minimum}$ 3.56 cm	K Factors
21,000	35,368	26,452	17,536	402
22,000	38,817	29,032	19,246	367
23,000	42,426	31,731	21,036	336
24,000	46,196	34,550	22,905	308
25,000	50,125	37,489	24,853	284
26,000	54,216	40,548	26,881	263
27,000	58,466	43,728	28,989	243
28,000	62,877	47,027	31,176	226
29,000	67,449	50,446	33,443	211
30,000	72,181	53,985	35,789	197
31,000	77,073	57,644	38,214	185
32,000	82,125	61,422	40,720	173
33,000	87,338	65,321	43,304	163
34,000	92,712	69,340	45,969	154
35,000	98,246	73,479	48,712	145
36,000	103,940	77,738	51,536	137
37,000	109,795	82,117	54,439	130
38,000	115,810	86,615	57,421	123
39,000	121,985	91,234	60,483	117
40,000	128,321	95,973	63,624	111
41,000	134,817	100,831	66,845	106
42,000	141,474	105,810	70,146	101
43,000	148,291	110,908	73,526	96.0
44,000	155,268	116,127	76,985	91.7
45,000	162,406	121,465	80,525	87.6
46,000	169,704	126,924	84,143	83.9
47,000	177,163	132,502	87,841	80.3
48,000	184,782	138,201	91,619	77.0
49,000	192,562	144,019	95,476	73.9
50,000	200,502	149,957	99,413	71.0
51,000	208,602	156,016	103,429	68.2
52,000	216,862	162,194	107,525	65.6
53,000	225,283	168,492	111,700	63.2
54,000	233,865	174,910	115,955	60.9
55,000	242,607	181,448	120,290	58.7

Table 2-4. T-8100 Rotor: RCF Values and K Factors*

	RCF			
Speed (rpm)	**$r_{maximum}$ 7.18 cm**	**$r_{average}$ 5.37 cm**	**$r_{minimum}$ 3.56 cm**	**K Factors**
56,000	251,509	188,106	124,704	56.6
57,000	260,572	194,884	129,197	54.6
58,000	269,795	201,782	133,770	52.8
59,000	279,178	208,800	138,423	51.0
60,000	288,722	215,938	143,155	49.3
61,000	298,426	223,196	147,966	47.7
62,000	308,291	230,574	152,857	46.2
63,000	318,316	238,072	157,828	44.7
64,000	328,502	245,690	162,878	43.3
65,000	338,480	253,428	168,008	42.0
66,000	349,354	261,286	173,217	40.7
67,000	360,020	269,263	178,506	39.5
68,000	370,848	277,361	183,874	38.4
69,000	381,835	285,579	189,322	37.3
70,000	392,983	293,916	194,849	36.2
71,000	404,291	302,374	200,456	35.2
72,000	415,760	310,951	206,143	34.2
73,000	427,389	319,649	211,909	33.3
74,000	439,178	328,466	217,754	32.4
75,000	451,128	337,404	223,679	31.6
76,000	463,239	346,461	229,684	30.7
77,000	475,509	355,639	235,768	29.9
78,000	487,940	364,936	241,931	29.2
79,000	500,532	374,353	248,175	28.4
80,000	513,284	383,891	254,497	27.7
81,000	526,196	393,548	260,899	27.1
82,000	539,269	403,325	267,381	26.4
83,000	552,502	413,222	273,942	25.8
84,000	565,895	423,239	280,583	25.2
85,000	579,449	433,376	287,304	24.6
86,000	593,164	443,634	294,103	24.0
87,000	607,038	454,011	300,983	23.4
88,000	621,073	464,508	307,942	22.9
89,000	635,269	475,125	314,980	22.4
90,000	649,625	485,861	322,098	21.9

Table 2-4. T-8100 Rotor: RCF Values and K Factors*

	RCF			
Speed (rpm)	**$r_{maximum}$ 7.18 cm**	**$r_{average}$ 5.37 cm**	**$r_{minimum}$ 3.56 cm**	**K Factors**
91,000	664,141	496,718	329,296	21.4
92,000	678,818	507,695	336,573	21.0
93,000	693,655	518,792	343,929	20.5
94,000	708,653	530,009	351,365	20.1
95,000	723,810	541,346	358,881	19.7
96,000	739,129	552,802	366,476	19.3
97,000	754,607	564,379	374,151	18.9
98,000	770,247	576,076	381,905	18.5
99,000	786,046	587,892	389,739	18.1
100,000	802,006	599,829	397,652	17.7

*These values do not take the thickness of the tube into consideration.

Chemical Compatibility

The critical components of the T-8100 Rotor likely to come in contact with solution are: rotor body (titanium), rotor cover assembly (titanium), rotor cap and tube cap (aluminum), tube plug (Buna N), O-rings (Buna N), plus the material of the tubes (or bottles) 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. 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 opposing tube compartments;

b. when using less than eight tubes, the rotor can be operated at its maximum allowable speed with two, four, or six samples, if opposing pairs of tubes are positioned as shown in figure 2-2;

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

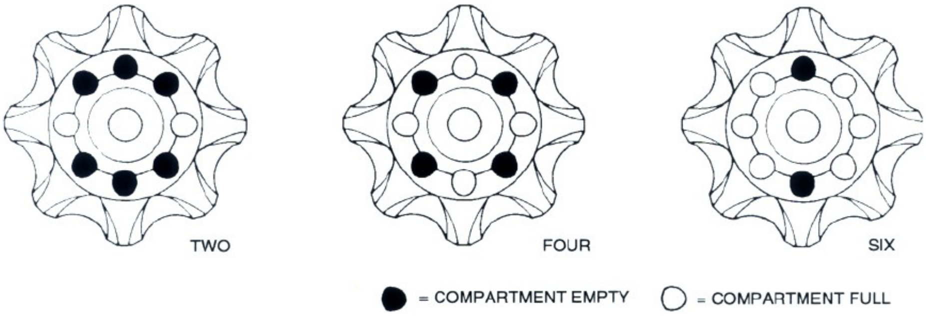

Figure 2-2. Rotor Balancing

Preparing Tubes and Bottles

Depending on the type of tube or bottle used and the set temperature of the run, the speed of the rotor may be limited when the liquid level is low, and collapse may occur. The liquid level must be full in the following cases:

a. when a thin tube or seal tube is used,

b. when a thick tube is used for a swinging rotor,

c. when a bottle is used at higher than or equal to 100,000 x g.

Rotor Loading and Sealing

Prepare the ULTRACRIMP® tubes 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 the filled and sealed ULTRACRIMP® tubes in the tube compartments, balancing the rotor as described above.
2. Place a rotor cap (Catalog No. 45662) in each tube compartment that contains a filled tube. Push the rotor cap into the tube compartment until it is properly seated (if necessary, apply a small amount of lubricating grease, Catalog No. 61556 to aid the loading process); when properly seated in the T-8100 rotor, the edge of the cap will will be flush with the top surface of the rotor. See figure 2-3. Read the CAUTION.

CAUTION Do not put a rotor cap in an empty tube compartment. Rotor caps should only be installed in compartments that contain a filled tube.
Rotor caps must be used and properly seated in the rotor to provide tube support during centrifugation.

3. Separate the locking nut from the rotor cover, and check locking nut O-ring and rotor cover O-ring for scuffs, cracks or breaks. Replace, if necessary (see Table 1-3 for replacement part catalog numbers).
4. Coat 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. Insert the locking nut in the cover and finger tighten the locking nut by turning it clockwise. Insert the rotor cover tool through the locking nut. Hold the cover to prevent it from turning, and continue turning the locking nut clockwise until rotor cover is tightened securely.

Remove the rotor cover tool from the locking nut. Read the CAUTION.

CAUTION The rotor cover tool must be removed prior to centrifuge run.

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

Perform the run as explained in the centrifuge instruction manual.

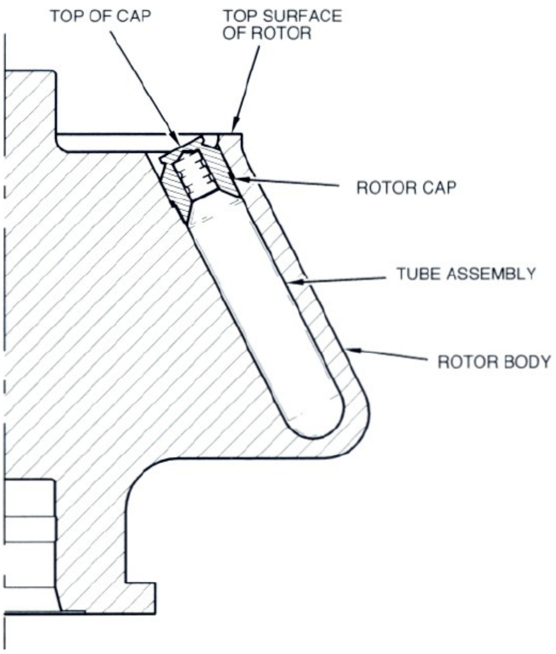

Figure 2-3. Properly Seated Rotor Cap in the T-8100 Rotor

Ultracentrifuge/ Rotor Log Book

An Ultracentrifuge/Rotor Log Book is supplied with the T-8100 Rotor so that you can easily record all data necessary to meet the warranty stipulation that any defective ultracentrifuge rotor (or ultracentrifuge) returned to Thermo Fisher Scientific must be accompanied by a current history of the rotor.

Each time the T-8100 Rotor is used, record the run in the appropriate log book. If desired, the information may be recorded elsewhere, however, it must include all data 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 or buckets that show signs of corrosion or cracking.

Contents

Corrosion

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.

The T-8100 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 useful 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 growing areas of visible deterioration. Stress corrosion attacks the inside of the metal as well; 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 reaction. 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 the rotor is thoroughly dried 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

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

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

Rotor Body

Wash the rotor body with warm water and mild, *non-alkaline* 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 the rotor surface. Use a bristle brush to loosen encrusted materials only if necessary; be careful not to scratch the rotor surface.

Ethylene oxide, a 2% glutaraldehyde solution, or ultraviolet radiation are the recommended methods of sterilization; however, the rotor body of the T-8100 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.

Rotor Cover Assembly (figure 3-1)

Wash the rotor cover assembly components with a mild detergent solution, rinse, then dry carefully before storing. DO NOT autoclave aluminum locking nut. If required, use gas or chemical sterilization.

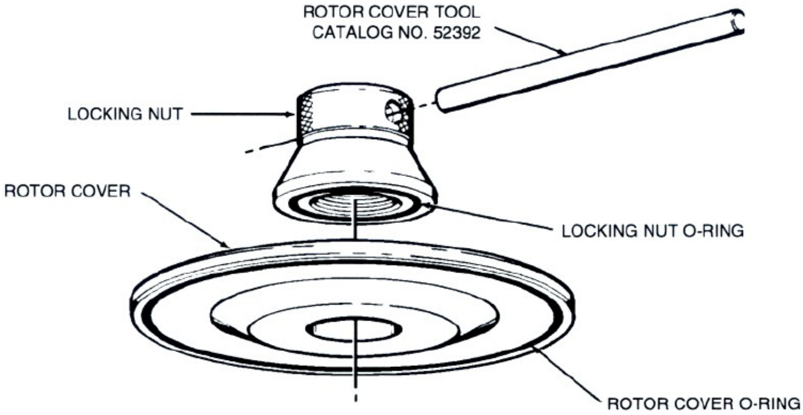

Figure 3-5. Rotor Cover Assembly

ULTRACRIMP® Sealing System Components

The ULTRACRIMP® Sealing Tool and the aluminum rotor caps should not be autoclaved. 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.

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.

Overspeed Decal Replacement

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

To replace the decal:

1. Remove the existing decal from the bottom of the rotor being 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 for the rotor being used. The decal for the T-8100 Rotor should have 9 black segments.

4. Peel the paper backing off 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 in place.

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 procedures to ensure the safety of all personnel:

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

   The Thermo Scientific Product Guide contains descriptions of commonly used decontamination methods and a chart showing method compatibility with various materials. 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 Thermo Fisher Scientific representative; be prepared with the name and nature of the sample so that 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 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. For shipment outside of the United States, check local regulations.

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 occu

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 the disposition of 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 Representative or Field Service Engineer. In the event that 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 a 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

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®
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.

Contact Information

United States	866-9-THERMO
	+1 866 984 3766
Canada	+1 866 984 3766
Austria	+43 1 801 400
Belgium	+32 2 482 30 30
Germany	08001 536 376
	+49 6184 90 6940
France	+33 2 2803 2180
	+33 2 2803 2000
Italy	+39 02 02 95059 341
Netherlands	+31 76 571 4440
Nordic / Baltic Countries	+35 89 329 100
Russia	+7 (812) 703 42 15

Spain	+34 932 23 09 18
Portugal	+34 932 23 09 18
Switzerland	+41 44 454 12 12
UK / Ireland	+44 870 609 9203
China	+86 21 6865 4588
	+86 10 8419 3588
India	+91 22 6716 2200
Japan	+81 45 453 9220
Other Asian Countries	+852 2885 4613
Latin America	+1 866 984 3766
Other Countries	+49 6184 90 6940
	+33 2 2803 2180

CHINA
Tel.: +86 21 68 65 45 88
Tel.: +86 10 58 50 35 88

INDIA
Tel.: +91 22 55 42 94 94

JAPAN
Tel.: +81 454 53 92 20

OTHER ASIA PACIFIC COUNTRIES
Tel.: +852 28 85 46 13

AUSTRIA
Tel.:+43 (1) 80 14 00

BELGIUM
Tel.: +32 24 82 30 30

FINLAND
Tel.: +35 89 32 91 00

FRANCE
Tel.: +33 1 69 18 77 77
+33 2 28 03 20 00

GERMANY
Tel.: +49 61 84 90 69 40
+49 61 03 40 81 012

ITALY
Tel.: +39 02 95 05 91

NETHERLANDS
Tel.: +31 7 65 71 44 40

SPAIN or PORTUGAL
Tel.: +34 9 32 23 31 54

SWITZERLAND
Tel : +41 (1) 4 54 12 12

UNITED KINGDOM or IRELAND
Tel.: +44 87 06 09 92 03

Other EUROPE, MIDDLE EAST, or AFRICA
Tel.: +49 61 84 90 69 40
+33 2 28 03 20 00

RUSSIA/CIS
Tel: +7 09 52 25 11 15

UNITED STATES of AMERICA
Tel.: +1 800 522 77 46
+1 866 984 37 66

CANADA or LATIN AMERICA
Tel.: +1 800 522 77 46
+1 866 984 37 66

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