



Thermo Scientific

TH13-6x50 Rotor

for Sorvall LYNX Superspeed Centrifuges

Instruction Manual

50137987-01

November 2012

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Certificate of Containment Testing

Containment Testing of Rotor TH13-6x50 in a Thermo Scientific Centrifuge

Report No. 170-12 E

Report Prepared For: Thermo Fisher Scientific

Issue Date: 10th October 2012

Test Summary

A TH13-6x50 rotor was containment tested in a Thermo Scientific centrifuge at 13,100 rpm at partial vacuum, using Annex AA of IEC 1010-2-20:2006 (2nd Ed.). The sealed rotor was shown to contain all contents.



Report Written By  Name: Ms Susan Macken Title: Biosafety Scientist	Report Authorised By  Name: Mrs Sara Speight Title: Senior Biosafety Scientist
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Preface

Before starting to use the rotor, read through this instruction manual carefully and follow the instructions.

The information contained in this instruction manual is the property of Thermo Fisher Scientific; it is forbidden to copy or pass on this information without explicit approval.

Failure to follow the instructions and safety information in this instruction manual will result in the expiration of the sellers warranty.

Scope of Supply

Article Number		Quantity	Check
75003010	TH13-6x50 Rotor	1	<input type="checkbox"/>
75003786	Lubricant for Metal Parts	1	<input type="checkbox"/>
70009824	Anti-corrosion Oil	1	<input type="checkbox"/>
75007002	Replacement O-Rings with Vacuum Grease	1	<input type="checkbox"/>
50136234	CD with Manual	1	<input type="checkbox"/>

If any parts are missing, please contact your nearest Thermo Fisher Scientific representative.



This symbol refers to general hazards.
CAUTION means that material damage could occur.
WARNING means that injuries or material damage or contamination could occur.



This symbol refers to biological hazards.
 Observe the information contained in the instruction manual to keep yourself and your environment safe.



This symbol means that the rotor and centrifuge manual contain additional important information. Observe the information contained in the instruction manual to keep yourself and your environment safe.

Precautions

WARNING

In order to ensure safe operation of the Thermo Scientific TH13-6x50 rotor, the following general safety regulations must be followed:

- Do not remove the magnet at the rotor bottom.
- Do not use rotors which show any signs of corrosion and/or cracks.
- Use only with rotors which have been loaded properly.
- Never overload the rotor.
- Use only accessories which have been approved by Thermo Fisher Scientific. Exceptions to this rule are commercially available glass or plastic centrifuge tubes, provided they have been approved for the speed or the RCF value of the rotor.
- Please observe the safety instructions.



Please pay particular attention to the following aspects:

- The rotor may be carried by the lid handle if the lid is properly tightened.
- Rotor installation: Check that the rotor is locked properly into place before operating the centrifuge.
- Always balance the samples.

Maximum sample density at maximum speed: $1.2 \frac{g}{cm^3}$

Rotor Information

Contents

- “Rotor Data” on page 1
- “Rotor Package” on page 2
- “Rotor Accessory” on page 2
- “Information on Tubes and Bottles” on page 2

Rotor Data

Centrifuge	Sorvall LYNX 6000	Sorvall LYNX 4000
Weight of Empty Rotor [kg]	7.2	7.2
Max. Cycle Number	50000	50000
Maximum Permissible Load [g]	6x80	6x80
Maximum Speed n_{max} [rpm]	13100	13100
Maximum RCF-Value at n_{max}	30314	30314
Minimum RCF-Value at n_{max}	10936	10936
K-Value at n_{max}	1503	1503
Radius max. / min. [cm]	15.8 / 5.7	15.8 / 5.7
Angle [°]	90	90
Accel. / Braking Time [s]	50 / 70	50 / 70
Maximum Speed at 4°C [s]	13100	13100
Sample Cooling at n_{max} [°C] (Ambient Temperature of 23°C, Run Time 60 Minutes)	<4	<4
Aerosol-tight*	Yes	Yes
Maximum Autoclave Temperature (°C)	121	121

*Tested and approved by HPA, Porton-Down, UK

1 Rotor Information

Rotor Package

Rotor Package

Description	Article Number
TH13-6x50 Rotor	75003010
Lubricant for Metal Parts	75003786
Anti-corrosion Oil	70009824
Replacement O-Rings with Vacuum Grease	75007002
CD with Manual	50136234

Rotor Accessory

Description	Article Number
Replacement Biocontainment Covers (Set of 2)	75003011

Information on Tubes and Bottles

Description	Article Number	Type	Article Number	Description
50 ml PA Thin-Walled Tube	03139			
50 ml Stainless Steel Tube	00579	Closure	00518	SS Sealing
		Tool	01014	Sealing Wrench
50 ml Nunc™ PP Conical Tube		Adapter	75004264	1 place/adapter (set of 6)
50 ml BD® PP Conical Tube		Adapter	75004264	1 place/adapter (set of 6)
50 ml Corning® PP Conical Tube		Adapter	75004264	1 place/adapter (set of 6)
50 ml Corning PET Conical Tube		Adapter	75004264	1 place/adapter (set of 6)
50 ml Sarstedt® PP Conical Tube		Adapter	75004264	1 place/adapter (set of 6)
50 ml Sterilin® PP Conical Tube		Adapter	75004264	1 place/adapter (set of 6)
50 ml Conical Filter Tube (e.g. Amicon®)		Adapter	75004264	1 place/adapter (set of 6)
50 ml Greiner® PP Conical Tube		Adapter	75004264	1 place/adapter (set of 6)
50 ml Greiner Light Protection Conical Tube		Adapter	75004264	1 place/adapter (set of 6)

Description	Article Number	Type	Article Number	Description
50 ml PC Flanged Tube	03146	Closure	03268	PP Snap-On
50 ml PP Flanged Tube	03147	Closure	03268	PP Snap-On
50 ml Nalgene PC Oak Ridge Tube	3118-0050	Closure	Included	PP Screw Top
50 ml Nalgene PPCO Oak Ridge Tube	3119-0050	Closure	Included	PP Screw Top
50 ml Nalgene PC Oak Ridge Tube	3138-0050	Closure	Included	PP Sealing
50 ml Nalgene PPCO Oak Ridge Tube	3139-0050	Closure	Included	PP Sealing
16 ml PP Flanged Tube	03244	Closure	03299	PP Snap-On
		Adapter	00382	1 place/adapter
15 ml Nunc PP Conical Tube1		Adapter	75007321	1 place/adapter (set of 2)
		Adapter	010-0378	1 place/adapter
15 ml Greiner PP Conical Tube		Adapter	75007321	1 place/adapter (set of 2)
		Adapter	010-0378	1 place/adapter
15 ml Greiner Light Protection Conical Tube		Adapter	75007321	1 place/adapter (set of 2)
		Adapter	010-0378	1 place/adapter
15 ml BD PP Conical Tube		Adapter	75007321	1 place/adapter (set of 2)
		Adapter	010-0378	1 place/adapter
15 ml Corning PP Conical Tube		Adapter	75007321	1 place/adapter (set of 2)
		Adapter	010-0378	1 place/adapter
15 ml Corning PET Conical Tube		Adapter	75007321	1 place/adapter (set of 2)
		Adapter	010-0378	1 place/adapter
15 ml Sarstedt PP Conical Tube		Adapter	75007321	1 place/adapter (set of 2)
		Adapter	010-0378	1 place/adapter
15 ml Sterilin PP Conical Tube		Adapter	75007321	1 place/adapter (set of 2)
		Adapter	010-0378	1 place/adapter
15 ml Conical Filter Tube (e.g. Amicon)		Adapter	75007321	1 place/adapter (set of 2)
12 ml PP Flanged Tube	03116	Closure	03266	PP Snap-On
		Adapter	00402	1 place/adapter
12 ml PC Flanged Tube	03115	Closure	03266	PP Snap-On
		Adapter	00402	1 place/adapter
10 ml Pyrex® Graduated Conical Tube		Adapter	00367	1 place/adapter
10 ml PC Oak Ridge Tube	03020	Closure	03279	PP Sealing

1 Rotor Information

Information on Tubes and Bottles

Description	Article Number	Type	Article Number	Description
		Closure	03924	PP Screw Top
		Adapter	00425	1 place/adapter
10 ml PP Oak Ridge Tube	03929	Closure	03279	PP Sealing
		Closure	03924	PP Screw Top
		Adapter	00425	1 place/adapter
7 ml PC Flanged Tube	03120	Closure	03265	PP Snap-On
		Adapter	00473	1 place/adapter
7 ml PP Flanged Tube	03121	Closure	03265	PP Snap-On
		Adapter	00473	1 place/adapter
4 ml PP Flanged Tube	03105	Closure	03264	PP Snap-On
		Adapter	00473	1 place/adapter
4 ml PC Flanged Tube	03104	Closure	03264	PP Snap-On
		Adapter	00381	2 Places/Adapter
3 ml Pyrex Tube	03100	Adapter	00364	2 Places/Adapter
1.5 ml Conical Microtube	314352H01	Adapter	00381	2 Places/Adapter
1 ml Cellulose (Acetate Butyrate) Tube	03103	Adapter	00408	4 Places/Adapter

Thermo Scientific Auto-Lock Rotor Exchange

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- “Open and Close Rotor” on page 3
- “Rotor Installation” on page 3
- “Removing the Rotor” on page 4

Open and Close Rotor

1. To tighten the lid, twist the lid handle clockwise until "hand tight". As a general rule, once the lid is tightend to the point of resistance, tighten an additional 1/4 turn.
2. To remove the lid, twist the lid handle counter clockwise until the lid can be removed from the rotor.

Note The rotor may be carried by the lid handle if the lid is properly tightened.

Rotor Installation



CAUTION Unapproved or incorrectly combined accessories can cause serious damage to the centrifuge.

This rotor is equipped with Thermo Scientific Auto-Lock rotor exchange.

This system is used to automatically lock the rotor to the centrifuge spindle, eliminating the need to manually bolt the rotor to the centrifuge spindle.

Proceed as follows:

1. Open the door of the centrifuge and if necessary remove any dust, foreign objects or residue from the chamber.

Auto-Lock and o-ring must be clean and undamaged.

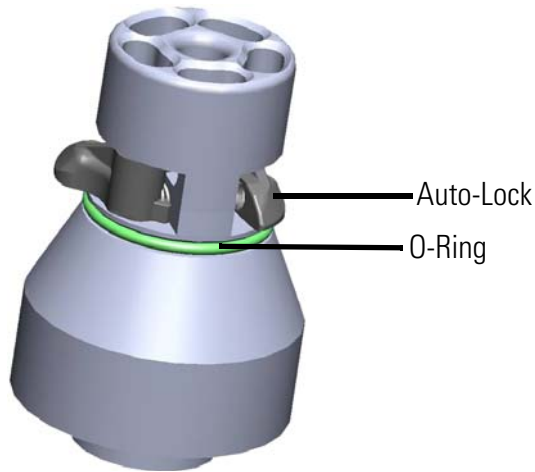


Figure 2-1. Auto-Lock

2. Place the rotor over the centrifuge spindle and let it slide slowly down the centrifuge spindle. The rotor clicks automatically into place.



CAUTION Do not force the rotor onto the centrifuge spindle. If the rotor is very light, then it may be necessary to press it onto the centrifuge spindle with a bit of pressure.

3. Check if the rotor is properly installed by lifting it slightly on the handle. If the rotor has not been locked, place the rotor over the centrifuge spindle again.



WARNING If the rotor cannot be properly locked in place after several attempts, then the Auto-Lock may be damaged and you are not permitted to operate the rotor. Check for any damage to the rotor: Damaged rotors must not be used. Keep the centrifuge spindle area of the rotor clear of objects. Operate the rotor always with the lid closed.



CAUTION Check that the rotor is properly locked on the centrifuge spindle before each use by pulling it at its handle.



CAUTION Be sure to check all sealings before starting any aerosol-tight applications.

4. Close the centrifuge door.

Removing the Rotor

To remove the rotor, proceed as follows:

1. Open the centrifuge door.

2. Grab the rotor handle with one or both hands and push down on against the Auto-Lock button. At the same time, pull the rotor directly upwards and remove it from the centrifuge spindle. Make sure not to tilt the rotor while doing this.

Note The rotor lid must be properly tightened to the rotor body in order to remove the rotor from the centrifuge.



Rotor Loading

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- “Proper Loading” on page 7
- “Improper Loading” on page 8
- “Maximum Loading” on page 8
- “Lifetime” on page 8

Before a Run

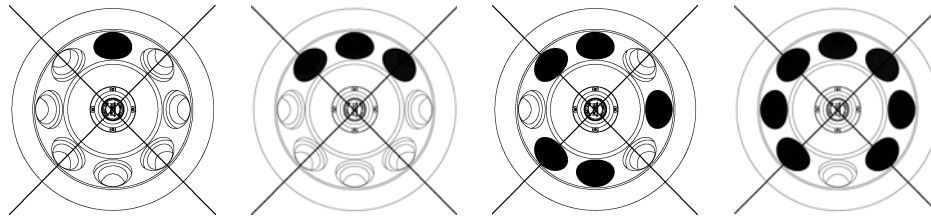
1. Please read and observe the safety instructions contained in these operating instructions and in the instructions for use.
2. Check the rotor and all accessory parts for damages such as cracks, scratches or traces of corrosion.
3. Check the rotor chamber, the centrifuge spindle and the Auto-Lock of the rotor.
4. Check the rotor’s suitability using the chemical compatibility chart on on [page-33](#).

Proper Loading



Note You can also fully load the rotor. It is very important that the tubes are balanced against each other.

Improper Loading



Maximum Loading

The rotor can run at high speeds. The rotor design has sufficient reserve stability even when spinning at top speed.

The safety system of the centrifuge requires that you do not overload the rotor.

There are two options available for centrifuging samples whose weight, including adapter, exceeds the maximum permissible load:

- Reduce the fill level.
- Reduce the speed.
- Calculate the maximum speed with this formula and set the centrifuge at the calculated maximum speed:

$$n_{\text{per}} = n_{\text{max}} \sqrt{\frac{\text{maximum permissible load}}{\text{actual load}}}$$

n_{per} = Permissible Speed

n_{max} = Maximum Speed

Lifetime

The lifetime of rotors and buckets is dependent on the amount of mechanical load. Do not exceed the number of cycles recommended for rotors and buckets.

The maximum number of cycles for the rotor is given in the rotor table in section “Rotor Data” on [page 1](#).

The maximum number of cycles for buckets is marked on the buckets themselves.



WARNING Replace the rotor when the specified number of cycles is reached. Due to the mechanical load a rotor can break and thus damage the centrifuge.

Service Life Examples

Usage profile	Maximum lifetime at 50,000 cycles
25 runs / day 200 days / year	10 years

Aerosol-tight Applications

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- “Basic Principles” on page 9
- “Fill Level” on page 9
- “Checking the Aerosol-Tightness” on page 9

Basic Principles



CAUTION Aerosol-tight rotors and tubes may only be opened in an approved safety work-bench when centrifuging dangerous samples. Mind the maximum permissible load.



CAUTION Be sure to check all sealings before starting any aerosol-tight applications.

- Check that the sample containers are well suited for the desired centrifugation process.

Fill Level

Open top tubes are only to be filled to a level which ensures that the sample is unable to reach the top of the tube during centrifugation. Therefore fill the tube only 2/3 of the rated level.

Checking the Aerosol-Tightness

The aerosol tightness testing of the rotors and buckets depend on the microbiological test process in accordance with the EN 61010-2-020 Appendix AA.

Whether or not a rotor is aerosol-tight depends primarily on proper handling.

Check as needed to make sure your rotor is aerosol-tight.

The careful inspection of the seals and seal surfaces for signs of wear and damage such as cracks, scratches and embrittlement is extremely important.

Aerosol-tight applications are not possible if the rotor is run without the lid.

4 Aerosol-tight Applications

Checking the Aerosol-Tightness

Aerosol-tightness requires the correct operation when filling the sample vessels and closing the rotor lid.

Quick Test

As a quick test, it is possible to test the aerosol-tightness of fixed-angle rotors using the following process:

1. Lubricate all seals lightly.
Always use the special grease 76003500 when lubricating the seals.
2. Fill the cavities with approx. 10 ml of carbonated mineral water.
3. Close the rotor as explained in the handling instructions.
4. Shake the rotor vigorously using your hands.
This releases the carbonic acid gas which is bound in the water, resulting in excess pressure. Do not apply pressure to the lid when doing so.

Leaks can be detected by escaping water or the sound of escaping gas.

Replace the seals if you detect any leaks. Then repeat the test.
5. Dry the rotor, rotor lid and the cover seal.



CAUTION Prior to each use, the seals in the rotor are to be inspected in order to assure that they are correctly seated and are not worn or damaged.

Maintenance and Care

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- “Cleaning” on page 11
- “Disinfection” on page 13
- “Decontamination” on page 14
- “Autoclaving” on page 14
- “Service of Thermo Fisher Scientific” on page 15

Cleaning Intervals

For the sake of personal, environmental, and material protection, it is your duty to clean and if necessary disinfect the rotor on a regular basis.

Maintenance	Recommended interval
Clean Rotor Chamber	Daily, when soiled, or after using corrosive buffers
Clean Rotor	Daily, when soiled, or after using corrosive buffers
Accessories	Daily, when soiled, or after using corrosive buffers



CAUTION Refrain from using any other cleaning or decontamination procedure than those recommended here, if you are not entirely sure that the intended procedure is safe for the equipment.
Use only approved cleansers.
If in doubt, contact Thermo Fisher Scientific.

Cleaning

Clean rotor and accessories as follows:

- Use warm water with a neutral solvent.

5 Maintenance and Care

Cleaning

- Never use caustic cleaning agents such as soap suds, phosphoric acid, bleaching solutions or scrubbing powder.
- Rinse the cavities out thoroughly.
- Use a soft brush without metal bristles to remove stubborn residue.
- Afterwards rinse with distilled water.
- Place the rotors on a plastic grate with their cavities pointing down.
- If drying boxes are used, the temperature must never exceed 50°C, since higher temperatures could damage the material and shorten the lifetime of the parts.
- Use only disinfectants with a pH of 6-8.
- Dry aluminum parts off with a soft cloth.
- After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (70009824). Also treat the rotor cavities with oil.
- Store the aluminum parts at room temperature or in a cold-storage room with the cavities pointing down.



CAUTION Before using any cleaning or decontamination methods except those recommended by the manufacturer, users should check with the manufacturer that the proposed method will not damage the equipment.

Clean rotor and accessories as follows:

1. Open the centrifuge.
2. Turn off the centrifuge.
3. Release the rotor.
4. Grasp the rotor with both hands and lift it vertically off the centrifuge spindle.
5. Remove the centrifuge tubes and adapters.
6. Use a neutral cleaning agent with a pH value between 6 and 8 for cleaning.
7. Dry all of the rotors and accessories after cleaning with a cloth or in a warm air cabinet at a maximum temperature of 50°C.
8. Store the rotor with its lid open.
 - After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (70009824). Also treat the rotor cavities with oil.
 - Grease the seal (76003500).
 - Grease the thread in the lid (75003786).



CAUTION When cleaning, do not allow liquids, especially organic solvents, to get on the drive shaft or the bearings of the centrifuge. Organic solvents break down the grease in the motor bearing. The drive shaft could freeze up.

Disinfection

Disinfect the centrifuge immediately whenever infectious material has spilled during centrifugation.



WARNING Infectious material can get into the centrifuge when a tube breaks or as a result of spills. Keep in mind the risk of infection when touching the rotor and take all necessary precautions.

In case of contamination, make sure that others are not put at risk.

Decontaminate the affected parts immediately.

Take other precautions if need be.

The rotor chamber and the rotor should be treated preferably with a neutral disinfectant.



CAUTION Before using any cleaning or decontamination methods except those recommended by the manufacturer, users should check with the manufacturer that the proposed method will not damage the equipment.

Observe the safety precautions and handling instructions for the cleaning agents used.

Contact the Service Department of Thermo Fisher Scientific for questions regarding the use of other disinfectants.

Disinfect the rotor and accessories as follows:

1. Open the centrifuge.
2. Turn off the centrifuge.
3. Release the rotor.
4. Grasp the rotor with both hands and lift it vertically off the centrifuge spindle.
5. Remove the centrifuge tubes and adapters and dispose of them or disinfect them.
6. Treat the rotor and accessories according to the instructions for the disinfectant. Adhere strictly to the given application times.
7. Be sure the disinfectant can drain off the rotor.
8. Rinse the rotor and accessories thoroughly with water.
9. Dispose of the disinfectant according to the applicable guidelines.
10. Dry all of the rotors and accessories after cleaning with a cloth or in a warm air cabinet at a maximum temperature of 50°C.
11. Store the rotor with its lid open.
 - After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (70009824). Also treat the rotor cavities with oil.
 - Grease the seal (76003500).
 - Grease the thread in the lid (75003786).

Decontamination

Decontaminate the centrifuge immediately whenever radioactive material has spilled during centrifugation.



WARNING Radioactive material can get into the centrifuge when a tube breaks or as a result of spills. Keep in mind the risk of infection when touching the rotor and take all necessary precautions.
In case of contamination, make sure that others are not put at risk.
Decontaminate the affected parts immediately.
Take other precautions if need be.



CAUTION Before using any cleaning or decontamination methods except those recommended by the manufacturer, users should check with the manufacturer that the proposed method will not damage the equipment.

For general radioactive decontamination use a solution of equal parts of 70% ethanol, 10% SDS and water.

1. Open the centrifuge.
2. Turn off the centrifuge.
3. Release the rotor.
4. Grasp the rotor with both hands and lift it vertically off the centrifuge spindle.
5. Remove the centrifuge tubes and adapters and dispose of them or disinfect them.
6. Rinse the rotor first with ethanol and then with de-ionized water.
 - Adhere strictly to the given application times.
7. Be sure the decontamination solution can drain off the rotor.
8. Rinse the rotor and accessories thoroughly with water.
9. Dispose of the decontamination solution according to the applicable guidelines.
10. Dry all of the rotors and accessories after cleaning with a cloth or in a warm air cabinet at a maximum temperature of 50°C.
11. Store the rotor with its lid open.
 - After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (70009824). Also treat the rotor cavities with oil.
 - Grease the seal (76003500).
 - Grease the thread in the lid (75003786).

Autoclaving

1. Before autoclaving clean rotor and accessories as described above.
2. Place the rotor on a flat surface.

- Rotors and adapter can be autoclaved at 121°C.
- The maximum permissible autoclave cycle is 20 minutes at 121°C.

Note No chemical additives are permitted in the steam.



CAUTION Never exceed the permitted temperature and duration when autoclaving. If the rotor shows signs of corrosion or wear, it must be replaced.

Service of Thermo Fisher Scientific

Thermo Fisher Scientific recommends having the centrifuge and accessories serviced once a year by an authorized service technician. The service technician checks the following

- the electrical equipment
- the suitability of the set-up site
- the lid lock and the safety system
- the rotor
- the fixation of the rotor and the drive shaft

Thermo Fisher Scientific offers inspection and service contracts for this work. Any necessary repairs are performed for free during the warranty period and afterwards for a charge.

This is only valid if the centrifuge has only been maintained by a Thermo Fisher Scientific service technician.

Shipping and Deposing of Centrifuge and Accessories

Contact the Thermo Scientific customer service before returning anything. You will receive a RMA that must be used for the shipping. When you have questions regarding the deposing the customer service will help you as well. The contact information can be found in “[Contact Information](#)” on [page 39](#).



WARNING Before shipping or deposing centrifuges and accessories you have to clean and if necessary disinfect or decontaminate everything. Before storing the centrifuge and the accessories it must be cleaned and if necessary disinfected and decontaminated.

RCF-Values

Speed rpm	R _{min}	R _{max}	RCF R _{min}	RCF R _{max}
500	5.7	15.8	44	16
600	5.7	15.8	64	23
700	5.7	15.8	87	31
800	5.7	15.8	113	41
900	5.7	15.8	143	52
1000	5.7	15.8	177	64
1100	5.7	15.8	214	77
1200	5.7	15.8	254	92
1300	5.7	15.8	299	108
1400	5.7	15.8	346	125
1500	5.7	15.8	397	143
1600	5.7	15.8	452	163
1700	5.7	15.8	511	184
1800	5.7	15.8	572	206
1900	5.7	15.8	638	230
2000	5.7	15.8	707	255
2100	5.7	15.8	779	281
2200	5.7	15.8	855	308
2300	5.7	15.8	934	337
2400	5.7	15.8	1017	367
2500	5.7	15.8	1104	398
2600	5.7	15.8	1194	431
2700	5.7	15.8	1288	465
2800	5.7	15.8	1385	500
2900	5.7	15.8	1486	536
3000	5.7	15.8	1590	574
3100	5.7	15.8	1698	612
3200	5.7	15.8	1809	653

A RCF-Values

Speed rpm	R_{min}	R_{max}	RCF R_{min}	RCF R_{max}
3300	5.7	15.8	1924	694
3400	5.7	15.8	2042	737
3500	5.7	15.8	2164	781
3600	5.7	15.8	2289	826
3700	5.7	15.8	2418	872
3800	5.7	15.8	2551	920
3900	5.7	15.8	2687	969
4000	5.7	15.8	2826	1020
4100	5.7	15.8	2969	1071
4200	5.7	15.8	3116	1124
4300	5.7	15.8	3266	1178
4400	5.7	15.8	3420	1234
4500	5.7	15.8	3577	1290
4600	5.7	15.8	3738	1348
4700	5.7	15.8	3902	1408
4800	5.7	15.8	4070	1468
4900	5.7	15.8	4241	1530
5000	5.7	15.8	4416	1593
5100	5.7	15.8	4595	1658
5200	5.7	15.8	4776	1723
5300	5.7	15.8	4962	1790
5400	5.7	15.8	5151	1858
5500	5.7	15.8	5343	1928
5600	5.7	15.8	5540	1998
5700	5.7	15.8	5739	2070
5800	5.7	15.8	5942	2144
5900	5.7	15.8	6149	2218
6000	5.7	15.8	6359	2294
6100	5.7	15.8	6573	2371
6200	5.7	15.8	6790	2450
6300	5.7	15.8	7011	2529
6400	5.7	15.8	7235	2610
6500	5.7	15.8	7463	2692
6600	5.7	15.8	7695	2776
6700	5.7	15.8	7930	2861
6800	5.7	15.8	8168	2947
6900	5.7	15.8	8410	3034

Speed rpm	R _{min}	R _{max}	RCF R _{min}	RCF R _{max}
7000	5.7	15.8	8656	3123
7100	5.7	15.8	8905	3212
7200	5.7	15.8	9157	3304
7300	5.7	15.8	9413	3396
7400	5.7	15.8	9673	3490
7500	5.7	15.8	9936	3585
7600	5.7	15.8	10203	3681
7700	5.7	15.8	10473	3778
7800	5.7	15.8	10747	3877
7900	5.7	15.8	11024	3977
8000	5.7	15.8	11305	4078
8100	5.7	15.8	11590	4181
8200	5.7	15.8	11878	4285
8300	5.7	15.8	12169	4390
8400	5.7	15.8	12464	4497
8500	5.7	15.8	12763	4604
8600	5.7	15.8	13065	4713
8700	5.7	15.8	13370	4823
8800	5.7	15.8	13679	4935
8900	5.7	15.8	13992	5048
9000	5.7	15.8	14308	5162
9100	5.7	15.8	14628	5277
9200	5.7	15.8	14951	5394
9300	5.7	15.8	15278	5512
9400	5.7	15.8	15608	5631
9500	5.7	15.8	15942	5751
9600	5.7	15.8	16280	5873
9700	5.7	15.8	16620	5996
9800	5.7	15.8	16965	6120
9900	5.7	15.8	17313	6246
10000	5.7	15.8	17664	6373
10100	5.7	15.8	18019	6501
10200	5.7	15.8	18378	6630
10300	5.7	15.8	18740	6761
10400	5.7	15.8	19106	6893
10500	5.7	15.8	19475	7026
10600	5.7	15.8	19848	7160

A RCF-Values

Speed rpm	R_{min}	R_{max}	RCF R_{min}	RCF R_{max}
10700	5.7	15.8	20224	7296
10800	5.7	15.8	20604	7433
10900	5.7	15.8	20987	7571
11000	5.7	15.8	21374	7711
11100	5.7	15.8	21764	7852
11200	5.7	15.8	22158	7994
11300	5.7	15.8	22556	8137
11400	5.7	15.8	22957	8282
11500	5.7	15.8	23361	8428
11600	5.7	15.8	23769	8575
11700	5.7	15.8	24181	8723
11800	5.7	15.8	24596	8873
11900	5.7	15.8	25015	9024
12000	5.7	15.8	25437	9177
12100	5.7	15.8	25862	9330
12200	5.7	15.8	26292	9485
12300	5.7	15.8	26724	9641
12400	5.7	15.8	27.61	9799
12500	5.7	15.8	27601	9957
12600	5.7	15.8	28044	10117
12700	5.7	15.8	28491	10278
12800	5.7	15.8	28941	10441
12900	5.7	15.8	29395	10605
13000	5.7	15.8	29853	10770
13100	5.7	15.8	30314	10936

Rotor Care Guide

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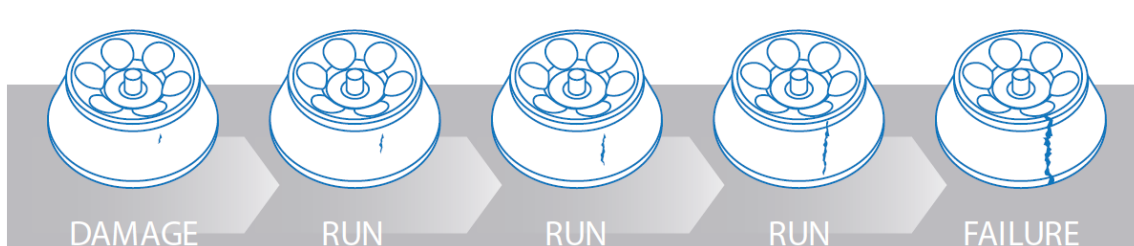
- “Routine Evaluation and Care of Your Rotor” on page 28
- “Proper Handling” on page 28
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Each time you use a rotor, visually inspect its condition for signs of physical wear or damage:

- Corrosion in the rotor cavities or exterior surfaces.
- Scratches or gouges to the base metal.
- Missing or worn anodizing.
- Damage to contact points, such as thread, hubs and screws.

Over time, stress observed in a typical fixed angle rotor will cause metal fatigue.

Heavy corrosion can result in premature rotor failure.



Routine Evaluation and Care of Your Rotor

Rotors are frequently damaged in use and this damage may be exacerbated under centrifugal forces. As a result, even a tiny flaw in a critical part of the rotor may generate stresses greater than the rotor was designed to withstand. Rotors are also subject to high levels of stress due to the centrifugal force created by high rotational speeds, and repeated cycles can cause metal rotors to stretch and change in size.

Proper Handling

Improper installation can lead to failure so it is imperative to:

- Always lock rotors to the spindle, if applicable.
- Ensure buckets are properly seated on their pins.
- Always use the tightening tool for locking and closing the rotor, if applicable.
- Use the proper rotor extractor tool to remove a rotor, if applicable.
- Avoid dropping or striking the rotor against a hard surface.
- Avoid putting anything inside the rotor that could scratch or nick the surface.

In addition, ensure that all tubes, bottles and adapters are being used within their specified limits and according to the manufacturer's directions. Tube or bottle failures during centrifugation can result in minor to severe damage to rotors and centrifuges.

Stress Corrosion

Stress distribution is an important consideration when evaluating the extent of rotor damage. Ultraspeed rotors experience the highest level of stress of all rotors; if it is run above its rated speed, it probably has exceeded its yield point. In this event, the metal is permanently deformed and rotor life is severely compromised. Lower speed metal rotors will also become fatigued, depending on the rotor type, number of runs and the speed of those runs. However, corrosion, improper handling and misuse will often require that you retire your rotor long before normal fatigue becomes a danger.

Missing Paint and Anodization

While missing paint will not affect the life of a titanium or carbon fiber rotor, missing anodization on an aluminum rotor may signal that it is time to retire the rotor.

Dropped Rotors

Deformation caused by dropping a metal rotor cannot be repaired, requiring that the rotor be replaced. In some cases, carbon fiber rotors are repairable if damaged.

Overheating

Melted bottles or other plastic or a rotor that is too hot to touch are indications that a rotor has overheated. Aluminum and carbon fiber rotors can be autoclaved up to 121°C, while titanium and stainless steel rotors can withstand higher temperatures and are not likely to be damaged by heat generated in the centrifuge.

Rotor Maintenance

Protect your rotor against damage or failure with preventive measures and maintain maximum centrifuge performance. However, if rotor damage is observed, ensure the safety of your lab by taking recommended action or contacting your sales representative for an inspection.

Potential Damage	Preventive Measures	Recommended Action
Damage to lid assembly	<ul style="list-style-type: none"> Lubricate periodically with a light film of o-ring or vacuum grease. Keep lid assembly lubricated with anti-galling grease Avoid banging or dropping Use care when removing o-rings. Clean with non-abrasive cloth and mild detergent. 	Return lid assembly parts to manufacturer for repair or replacement.
Damage to biocontainment sealing lid	<ul style="list-style-type: none"> Use care when removing o-rings. Inspect and replace o-rings regularly. 	Replace sealing lid to ensure proper containment
Scoring to the bottom of the rotor (outside of cone area)	<ul style="list-style-type: none"> Gently place rotor on the centrifuge spindle. <p>Clean with non-abrasive cloth and mild detergent.</p> <ul style="list-style-type: none"> Inspect centrifuge mated parts for burrs and ensure no debris in centrifuge chamber. Store rotor on rotor stand or soft surface. 	Return rotor to manufacturer for evaluation or replacement.
Damage to the rotor drive pins	<ul style="list-style-type: none"> Gently place rotor on the centrifuge spindle. Ensure rotor is securely locked to centrifuge drive. 	Return rotor to manufacturer for replacement of rotor hub adapter or replace rotor depending on degree of damage/corrosion.
Pitting from corrosion in the bottom of tube cavity (metal rotors)	<ul style="list-style-type: none"> Ensure rotor is dried thoroughly between runs. Clean rotor immediately after use and when exposed to chemicals with approved solvent. Remove adapters after use, rinse and dry. 	Return rotor to manufacturer for evaluation.
Cracked or de-laminated rotor	<ul style="list-style-type: none"> Avoid sharp impact. Avoid harsh chemicals Clean the surface of rotor and coat with a thin layer of oil to prevent corrosion. 	Return rotor to manufacturer for evaluation.

Potential Damage	Preventive Measures	Recommended Action
Damage to rotor tie-down threads	<ul style="list-style-type: none"> Avoid cross threading of parts. Never use metallic or abrasive objects to clean. Clean and lubricate regularly. 	Replace rotor tie-down assembly.
Damage to bucket seats	<ul style="list-style-type: none"> Lubricate buckets regularly. Slide buckets into place carefully to avoid dropping or forcing into position. 	Replace rotor bucket set.
Windshield damage	<ul style="list-style-type: none"> Avoid banging or dropping. Do not exceed rotor's maximum compartment mass. Ensure windshield area is free of debris. 	Replace rotor to avoid vibration that will wear the drive.
Rotor bucket cap damage	<ul style="list-style-type: none"> Avoid cross threading of parts. Never use metallic objects to clean. Clean and lubricate regularly. 	Replace rotor bucket caps and return set for rebalancing (if applicable).
Rotor bucket damage	<ul style="list-style-type: none"> Avoid banging or dropping Do not exceed rotor's maximum compartment mass. Ensure buckets are free of debris. 	Replace rotor buckets or return bucket set for rebalancing.
Gouges or corrosion on surface of rotor	<ul style="list-style-type: none"> Inspect before every use. 	Return rotor to manufacturer for evaluation or replacement.
Septa damage in continuous flow or zonal rotor	<ul style="list-style-type: none"> Avoid sharp impact. Avoid harsh chemicals Clean the surface of rotor and coat with a thin layer of oil to prevent corrosion. 	Return rotor to manufacturer for evaluation.
Light scratches on surface	<ul style="list-style-type: none"> Avoid banging or dropping. Never use metallic objects to remove debris. 	Monitor to ensure no corrosion has occurred.
Bent centrifuge spindle	<ul style="list-style-type: none"> Remove rotor in a straight up motion. Ensure samples are properly balanced 	Call service for replacement of centrifuge spindle

Corrosion, pitting and even minor surface imperfections affect metal rotor life by increasing stress and, as a result, make it difficult to predict at what point the rotor material could fail.

Maintenance and Care

Metal corrosion can be avoided by following a routine maintenance program after each rotor use:

- Clean rotors, lids, adapters and any associated parts with a neutral cleaning agent with a pH value between 6 and 8. Rinse with distilled water and dry thoroughly with a soft cloth.
- Do not use strong alkaline laboratory detergent on aluminum rotors; if encrusted material is present, remove it with a soft, twisted-bristle brush and the 1% non-alkaline soap solution.
- For benchtop, lowspeed and superspeed swinging bucket rotors, keep the bucket trunnion pins clean and lubricated.

- Lubricate o-rings with vacuum grease and metal rotor threads with anti-galling grease (75003786) weekly, when specified in rotor manual.
- Apply an additional coating of anti-corrosion oil (70009824) to prolong the life of an anodized coating.
- Refer to the Maintenance and Care chapter in this rotor manual.

Storage

Any moisture left on a metal rotor can initiate corrosion, so after cleaning ensure proper storage:

- Remove all adapters from rotor cavities when not in use.
- Dry and store upside-down Use a PTFE-coated or plastic matting to allow for airflow or a ventilated shelf to avoid gathering condensation in the cavity or bucket bottom.

Decontamination

Given the nature of samples processed in a rotor, biological or radioactive contamination is possible. For biological contamination of rotors, a 2% glutaraldehyde solution, ethylene oxide or ultraviolet radiation are the recommended methods of sterilization, While for a rotor that may be contaminated by a radioactive sample, use a solution of equal parts of 70% ethanol, 10% SDS and water. In addition:

- Do not use chlorine bleach on aluminum rotors.
- When autoclaving, rotor components should be separated.
- If sterilization is not necessary, a 70% solution of ethanol can be used.
- Most commercially available detergents for radioisotopic contamination are not compatible with aluminum or anodized coatings and shall not be used.
- Rinse with ethanol, followed by water and dry with a soft cloth.
- Do not immerse Thermo Scientific Fiberlite rotors; spin rotor to remove liquid.
- Fiberlite composite rotors are not compatible with ethylene oxide.

Chemical Compatibility Chart

CHEMICAL	MATERIAL	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIIN	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL	NYLON	PET ¹ , POLYCLEAR, CLEARCRIMP	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYTRHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A, TEFLON	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON	VITON
2-mercaptoethanol	S	S	U	-	S	M	S	-	S	U	S	S	U	S	S	-	S	S	S	S	U	S	S	S	S	S	S	S
Acetaldehyde	S	-	U	U	-	-	-	M	-	U	-	-	-	M	U	U	U	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	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	S	M	S	S	S	S	-	S	S	S	S	S	M	U	U	S	S
Formic Acid (100%)	-	S	M	U	-	-	U	-	-	-	-	U	-	S	M	U	U	S	S	-	U	S	-	U	S	-	U	
Ammonium Acetate	S	S	U	-	S	S	S	-	S	S	S	S	S	S	S	U	-	S	S	S	S	S	S	S	S	S	S	S
Ammonium Carbonate	M	S	U	S	S	S	S	S	S	S	S	S	S	S	U	U	-	S	S	S	S	S	S	M	S	S	S	
Ammonium Hydroxide (10%)	U	U	S	U	S	S	M	S	S	S	S	S	-	S	U	M	S	S	S	S	S	S	S	S	S	S	M	S
Ammonium Hydroxide (28%)	U	U	S	U	S	U	M	S	S	S	S	S	U	S	U	M	S	S	S	S	S	S	S	S	S	S	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	M	S	S	S	S	
Benzene	S	S	U	U	S	U	M	U	S	U	U	S	U	U	U	M	U	M	U	U	U	U	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	
Cesium Acetate	M	-	S	-	S	S	S	-	S	S	S	S	-	S	S	-	-	S	S	S	S	S	M	S	S	S	S	

C Chemical Compatibility Chart

CHEMICAL	MATERIAL																											
	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL	NYLON	PET ¹ , POLYCLEAR, CLEARCRIMP	POLYALLUMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A, TEFLON	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON	VITON	
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	U	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	
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	

CHEMICAL	MATERIAL																										
	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL	NYLON	PET ¹ , POLYCLEAR, CLEARCRIMP	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A, TEFLON	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON	VITON
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
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

C Chemical Compatibility Chart

CHEMICAL	MATERIAL																										
	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL	NYLON	PET ¹ , POLYCLEAR, CLEARCRIMP	POLYALLUMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A, TEFLON	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON	VITON
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	M	S	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	M	S	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	U	M	S	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
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	M	S	S	S	S
Rubidium Chloride	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	M	S	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

CHEMICAL	MATERIAL																											
	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL	NYLON	PET*, POLYCLEAR, CLEARCRIMP	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A, TEFLON	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON	VITON	
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

C Chemical Compatibility Chart

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. 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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