



Thermo Scientific

BIOFlex HS Rotor

for Sorvall LYNX Superspeed Centrifuges

Instruction Manual

50137979-01

November 2012

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Certificate of Containment Testing

Containment Testing of Rotor BioFlex HS in a Thermo Scientific Centrifuge

Report No. 170-12 F

Report Prepared For: Thermo Fisher Scientific

Issue Date: 10th October 2012

Test Summary

A BioFlex HS rotor was containment tested in a Thermo Scientific centrifuge at 7,000 rpm, using Annex AA of IEC 1010-2-20:2006 (2nd Ed.). The sealed rotor was shown to contain all contents.


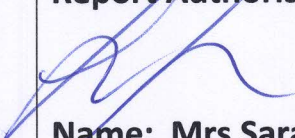
Report Written By  Name: Ms Susan Macken Title: Biosafety Scientist	Report Authorised By  Name: Mrs Sara Speight Title: Senior Biosafety Scientist
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Preface

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
75003002	BIOFlex HS Rotor, including 4 Buckets	1	<input type="checkbox"/>
75003786	Lubricant for metal parts	1	<input type="checkbox"/>
70009824	Anti-corrosion Oil	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 BIOFlex HS 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 handle.
- 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]	7.64	7.64
Max. Cycle Number	30000	30000
Maximum Permissible Load [g]	4x600	4x600
Maximum Speed n_{max} [rpm]	7000	7000
Maximum RCF-Value at n_{max}	10025	10025
Minimum RCF-Value at n_{max}	3890	3890
K-Value at n_{max}	4889	4889
Radius max. / min. [cm]	18.3 / 7.1	18.3 / 7.1
Angle [°]	90	90
Accel. / Braking Time [s]	40 / 65	40 / 65
Maximum Speed at 4°C [s]	7000	7000
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
BIOFlex HS Rotor, including 4 Buckets	75003002
Lubricant for metal parts	75003786
Anti-corrosion Oil	70009824
CD with Manual	50136234

Rotor Accessory

Description	Article Number
ClickSeal Biocontainment Lids (qty. 4)	75003656
O-Ring Replacment Kit for ClickSeal Lids (qty. 4)	75003657
Rotor Stand	75003711
Replacement Biocontainment Cap for Double Biocontainment Vessel for 50 mL Conical Tube (qty. 1)	50129119
Replacement O-Ring for Biocontainment Cap for Double Biocontainment Vessel for 50 mL Conical Tube (qty. 6)	75007002

Information on Tubes and Bottles

Description	Article Number	Type	Article Number	Description
400 ml Polypropylene Bio-Bottle	75007585			
250 ml Nalgene Wide-Mouth Conical Bottle		Adapter	75004258	1 place/adapter
225 ml BD Falcon® Conical Bottle		Adapter	75004257	1 place/adapter
		Adapter	BD 352090	1 place/adapter
250 ml Nalgene PP Oak Ridge Bottle	3141-0250	Adapter	75004257	1 place/adapter
250 ml Nalgene PC Oak Ridge Bottle	3140-0250	Adapter	75004257	1 place/adapter
200 ml Nunc™ PP Conical Bottle	376813		75004258	1 place/adapter
175 ml Nalgene PP Wide-Mouth Conical Bottle	3143-0175		75004258	1 place/adapter
175 ml Nalgene PC Wide-Mouth Conical Bottle	3144-0175		75004258	1 place/adapter
100 ml Round Bottom Open-Top Tube		Adapter	75003708	1 place/adapter
50 ml DIN Round Bottom Tube		Adapter	75003707	3 places/adapter
50 ml Nalgene PP Oak Ridge Tube	3139-0050	Adapter	75003799	4 places/adapter

Description	Article Number	Type	Article Number	Description
50 ml Nalgene PC Oak Ridge Tube	3138-0050	Adapter	75003799	4 places/adapter
50 ml Conical Tissue Culture Tube		Adapter	75003683	4 places/adapter
50 ml Conical Tissue Culture Tube		Adapter	75005393	3 places/adapter
Double Biocontainment Vessels for 50 mL Conical Tube		Adapter	75004259	3 places/adapter
30 ml DIN Round/Flat Bottom Tube		Adapter	75003703	5 places/adapter
20 ml Round Bottom Tube		Adapter	75003706	3 places/adapter
16 ml Nalgene PP Round Bottom Tube	3139-0016	Adapter	75003798	7 places/adapter
16 ml Nalgene PC Round Bottom Tube	3138-0016	Adapter	75003798	7 places/adapter
15 ml Conical Tissue Culture Tube		Adapter	75005394	9 places/adapter
15 ml Blood Collection Tube (17 x 125 mm)		Adapter	75003794	4 places/adapter
15 ml Round Bottom Tube (Sarstedt®)		Adapter	75003704	10 places/adapter
10/15 ml Corex®/Kimble® Tube or 10 mL Blood Collection (BD Vacutainer®/Vacurette®)		Adapter	75003681	14 places/adapter
5/7 ml Blood Collection Tube (Vacutainer)		Adapter	75003680	19 places/adapter
4.5/6 ml Blood Collection Tube (Greiner®)		Adapter	75003825	16 places/adapter
3/5 ml RIA or Round Bottom Tube (without cap)		Adapter	75003793	19 places/adapter
1.5-2 ml Conical/Round Microtube		Adapter	75003700	34 places/adapter
PA Thin-Walled Tube	03139			
		Adapter	00473	1 Place/Adapter
PP Flanged Tube	03105	Closure	03264	PP Snap-On
		Adapter	00473	1 Place/Adapter
PC Flanged Tube	03104	Closure	03264	PP Snap-On
		Adapter	00381	2 Places/Adapter
Pyrex Tube	03100	Adapter	00364	2 Places/Adapter
Conical Microtube	314352H01	Adapter	00381	2 Places/Adapter
Cellulose (Acetate Butyrate) Tube	03103	Adapter	00408	4 Places/Adapter

Thermo Scientific Auto-Lock Rotor Exchange

Contents

- “Open and Close Rotor” on page 3
- “Rotor Installation” on page 5
- “Removing the Rotor” on page 6

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.

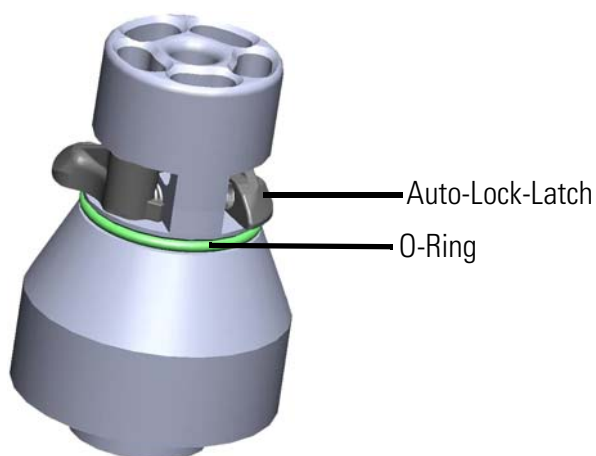


Figure 1. Auto-Lock Adapter

2 Thermo Scientific Auto-Lock Rotor Exchange

Removing the Rotor

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.



Figure 2. Removing the Rotor

Rotor Loading

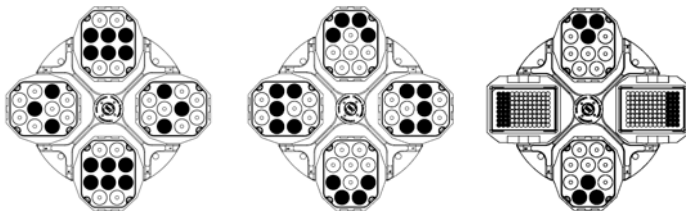
Contents

- “Before a Run” on page 7
- “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 [page-31](#).

Proper Loading

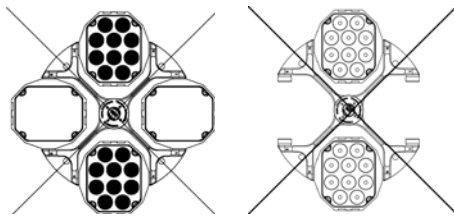


Improper Loading



WARNING

- Opposing buckets must be equally loaded.
- The maximum difference between two buckets next to each other is <200g.
- When you operate only two buckets fill the other two with water.



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 30,000 cycles
25 runs / day 200 days / year	6 years

Lifetime until coating is worn off depends on speed and load, that means it will be different for every user.

Aerosol-tight Applications

Contents

- “Basic Principles” on page 11
- “Fill Level” on page 11
- “Checking the Aerosol-Tightness” on page 11

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 using the following process:

1. Lubricate all seals lightly.
Always use the special grease (76003500) when lubricating the seals.
2. Fill the bucket with approx. 10 ml of carbonated mineral water.
3. Close the bucket as explained in the handling instructions.
4. Shake the bucket 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.

Damaged seals are to be replaced immediately.

Replacement seals are not supplied with the rotors and can also be re-ordered as a spare parts set (75007001).

When loading the rotor, ensure that the rotor lid closes securely.

Damaged or clouded rotor covers are to be replaced immediately.

Aerosol-tight Closure with ClickSeal

1. If necessary, grease the lid joint before closing the lid. Use grease (76003500) for this.
2. Raise the latch.
The cap can now be easily placed on the bucket.

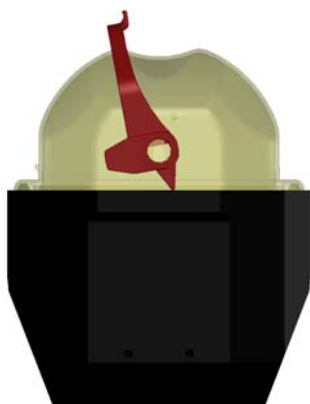


Figure 3. Bucket with open lid

3. Lower the latch to close the bucket aerosol-tight; be sure the latch clicks into place.



Figure 4. Bucket with closed lid



CAUTION If the latch is not flipped down, the caps could be damaged during centrifuging.
If the latch has not clicked into place, the bucket is not aerosol-tight.
Never raise the bucket at its latch.

Maintenance and Care

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- “Cleaning” on page 17
- “Disinfection” on page 17
- “Decontamination” on page 19
- “Autoclaving” on page 20
- “Service of Thermo Fisher Scientific” on page 21

Cleaning Intervals

For the sake of personal, environmental, and material protection, it is your duty to clean and if necessary disinfect the centrifuge 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
Cabinet	Once per month
Ventilation holes	Every six months



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.
- 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 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 centrifuge and accessories as follows:

1. Open the centrifuge.
2. Turn off the centrifuge.
3. Pull out the power supply plug.
4. Grasp the rotor with both hands and lift it vertically off the centrifuge spindle.
5. Remove the centrifuge tubes and adaptors.
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. Clean the housing of the centrifuge as needed.
 - After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (70009824). Also treat the cavities with oil.
 - Tread the bold of the swing out rotor with bold grease (75003786).



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

After some applications there might be ice in the rotor chamber. Let the ice melt and drain it off. Clean the rotor chamber as described above.

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.

Use a sprayer whenever possible so that all surfaces are covered evenly.

The rotor chamber and the rotor should be treated preferably with a neutral disinfectant. A disinfectant spray would be most suitable for this purpose so that the rotor and accessory surfaces are covered evenly.



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. Pull out the power supply plug.
4. Grasp the rotor with both hands and lift it vertically off the centrifuge spindle.
5. Remove the centrifuge tubes and adaptors and dispose of them or disinfect them.
6. Treat the rotor and accessories according to the instructions for the disinfectant (spray or soak in solution). Adhere strictly to the given application times.
7. Be sure the disinfectant can drain off the rotor.
8. Rinse the rotor and rotor lid thoroughly with water and then rub down.
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.
 - After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (70009824). Also treat the cavities with oil.
 - Treat the bold of the swing out rotor with bold grease (75003786).

Decontamination

Decantamine 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.

Disinfect the rotor and accessories as follows:

1. Open the centrifuge.
2. Turn off the centrifuge.

5 Maintenance and Care

Autoclaving

3. Pull out the power supply plug.
4. Grasp the rotor with both hands and lift it vertically off the centrifuge spindle.
5. Remove the centrifuge tubes and adaptors 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.
 - After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (70009824). Also treat the cavities with oil.
 - Treat the bold of the swing out rotor with bold grease (75003786).

Autoclaving

1. Before autoclaving clean rotor and accessories and 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.

Clean the rotor before autoclaving and rinse it with distilled water. Remove all accessories (tubes, adapters) from the rotor. Place the rotor on a flat surface.

Hinweis 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 technicians check the following:

- the electrical equipment
- the suitability of the set-up site
- the door 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.

Shipping and Depositing 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 depositing the customer service will help you as well. The contact information can be found in [“Contact Information”](#) on [page 39](#).



WARNING Before shipping or depositing 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}
600	7.1	18.3	29	74
700	7.1	18.3	39	100
800	7.1	18.3	51	131
900	7.1	18.3	64	166
1000	7.1	18.3	79	205
1100	7.1	18.3	96	248
1200	7.1	18.3	114	295
1300	7.1	18.3	134	346
1400	7.1	18.3	156	401
1500	7.1	18.3	179	460
1600	7.1	18.3	203	524
1700	7.1	18.3	229	591
1800	7.1	18.3	257	663
1900	7.1	18.3	287	739
2000	7.1	18.3	318	818
2100	7.1	18.3	350	902
2200	7.1	18.3	384	990
2300	7.1	18.3	420	1082
2400	7.1	18.3	457	1178
2500	7.1	18.3	496	1279
2600	7.1	18.3	537	1383
2700	7.1	18.3	579	1491
2800	7.1	18.3	622	1604
2900	7.1	18.3	668	1721
3000	7.1	18.3	714	1841
3100	7.1	18.3	763	1966
3200	7.1	18.3	813	2095
3300	7.1	18.3	864	2228

A RCF-Values

Speed rpm	R _{min}	R _{max}	RCF R _{min}	RCF R _{max}
3400	7.1	18.3	918	2365
3500	7.1	18.3	972	2506
3600	7.1	18.3	1029	2652
3700	7.1	18.3	1087	2801
3800	7.1	18.3	1146	2954
3900	7.1	18.3	1207	3112
4000	7.1	18.3	1270	3274
4100	7.1	18.3	1334	3439
4200	7.1	18.3	1400	3609
4300	7.1	18.3	1468	3783
4400	7.1	18.3	1537	3961
4500	7.1	18.3	1607	4143
4600	7.1	18.3	1680	4329
4700	7.1	18.3	1753	4519
4800	7.1	18.3	1829	4714
4900	7.1	18.3	1906	4912
5000	7.1	18.3	1984	5115
5100	7.1	18.3	2065	5321
5200	7.1	18.3	2146	5532
5300	7.1	18.3	2230	5747
5400	7.1	18.3	2315	5966
5500	7.1	18.3	2401	6189
5600	7.1	18.3	2489	6416
5700	7.1	18.3	2579	6647
5800	7.1	18.3	2670	6883
5900	7.1	18.3	2763	7122
6000	7.1	18.3	2858	7365
6100	7.1	18.3	2954	7613
6200	7.1	18.3	3051	7865
6300	7.1	18.3	3151	8120
6400	7.1	18.3	3251	8380
6500	7.1	18.3	3354	8644
6600	7.1	18.3	3458	8912
6700	7.1	18.3	3563	9184
6800	7.1	18.3	3670	9460
6900	7.1	18.3	3779	9741
7000	7.1	18.3	3890	10025

Rotor Care Guide

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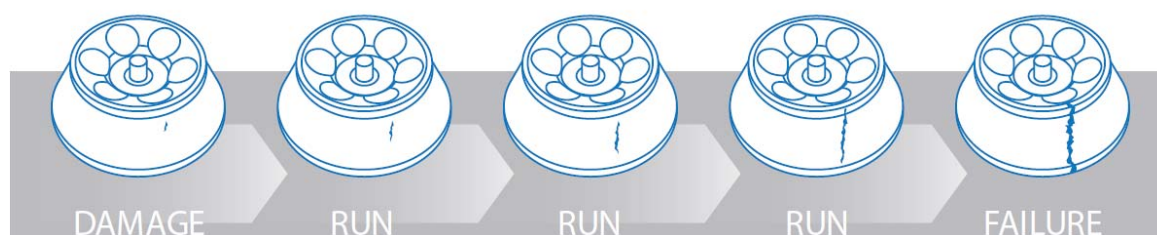
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Each time you use a rotor, visually inspect its condition for signs of physical wear or damage:

- 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 -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.

Cleaning is recommended every 300-500 cycles.

Lubrication on trunnion pins is needed, when the coating is worn off. When it is worn off, first start cleaning the bucket groove and trunnion pins. Remove any abraded particles.

- 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.

Notice If an imbalance error occurs: clean bucket groove and trunnion pins. Remove any abraded particles.

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	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	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	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	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	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	S
Cesium Acetate	M	-	S	-	S	S	S	-	S	S	S	S	-	S	S	-	-	S	S	S	S	S	M	S	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	M	S	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	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	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	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

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	
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	S	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	

¹Polyethyleneterephthalate

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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