thermoscientific

Thermo Scientific T29 - 8 x 50 Rotor

Instruction Manual

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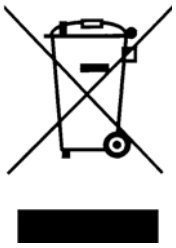
ThermoFisher SCIENTIFIC

WEEE Conformity

This product is subject to the regulations of the EU Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EU. It is marked by the following symbol:



Health Protection Agency
Microbiology Services
Porton Down
Salisbury
Wiltshire
SP4 0JG

Certificate of Containment Testing

Containment Testing of Rotor T29-8x50 in a Thermo Scientific Centrifuge

Report No. 170-12 I

Report Prepared For: Thermo Fisher Scientific
Issue Date: 10th October 2012

Test Summary

A T29-8x50 rotor was containment tested in a Thermo Scientific centrifuge at 29,000 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	Report Authorised By
Anna Moy	
Name: Ms Anna Moy	Name: Mrs Sara Speight
Title: Biosafety Scientist	Title: Senior Biosafety Scientist

Table of Contents

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
75003009	T29-8x50 Rotor	1	☐
75003786	Grease for Threads	1	☐
70009824	Anti-corrosion Oil	1	☐
75007009	Replacement O-Rings with Vacuum Grease	1	☐
65614	Retaining Ring Pliers	1	☐
50136234	CD with Manual	1	☐

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 T29-8x50 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

Centrifuge	Sorvall Lynx 6000	Sorvall Lynx 4000
Weight of empty Rotor [kg]	8.9	8.9
Max. Cycle Number	50000	50000
Maximum permissible Load [g]	8x75	8x75
Maximum Speed n_{max} [rpm]	29000	24000
Maximum RCF-Value at n_{max}	100605	68905
Minimum RCF-Value at n_{max}	21103	21103
K-Value at n_{max}	354	
Radius max. / min. [cm]	10.7 / 3.3	10.7 / 3.3
Angle [°]	34	34
Maximum Speed at 4 °C [s]	24000	21500
Sample Cooling at n_{max} [°C] (Ambient Temperature of 23 °C, Run Time 60 Minutes)	22	13
Aerosol-tight[1]	Yes	Yes
Maximum Autoclave Temperature (°C)	121	121

[1] Tested and approved by HPA, Porton-Down, UK

Rotor Package

Description	Article Number
T29-8x50 Rotor	75003009
Grease for Threads	75003786
Anti-corrosion Oil	70009824
RePlacement O-Rings with Vacuum Grease	75007009
Retaining Ring Pliers	65614
CD with Manual	50136234

Rotor Accessory

Description	Article Number
Rotor Stand	75003711
Ultracrimp Sealing Tool and Crimp Gauge	03920
Ultracrimp Gauge RePlacement	03919
Ultracrimp Extra Plugs and Caps	03999
Rotor Cap	03538

Information on Tubes and Bottles

Description	Article Number	Type	Article Number	Description
PC Flanged Tube	03146	Closure	03268	PP Snap-on
PA Thin-Walled Tube	03139	–	–	–
Nalgene FEP Oak Ridge Tube	3114-0050	Closure	Included	FEP Sealing
Nalgene PC Oak Ridge Style Tube	3138-0050	Closure	Included	PP Sealing
Nalgene PPCO Oak Ridge Style Tube	3139-0050	Closure	Included	PP Sealing
SS Flanged Tube	00517	Closure	00518	Stainless Steel Sealing
		Tool	01014	Wrench
Nalgene PC Oak Ridge Tube	3138-0030	Closure	Included	PP Sealing
		Adapter	00419	1 Place/Adapter
Nalgene PP Oak Ridge Tube	3139-0030	Closure	Included	PP Sealing
		Adapter	00419	1 Place/Adapter
Glass Tube	–	Adapter	00368	Optional Caps

Description	Article Number	Type	Article Number	Description
Nalgene PC Oak Ridge Tube	3138-0016	Closure	Included	PA Sealing
		Adapter	00382	1 Place/Adapter
Nalgene PP Oak Ridge Tube	3139-0016	Closure	Included	PA Sealing
		Adapter	00382	1 Place/Adapter
PP Flanged Tube	03244	Closure	03299	HDPE Sealing
		Adapter	00382	1 Place/Adapter
PP Flanged Tube	03116	Closure	03266	PP Snap-On
		Adapter	00402	1 Place/Adapter
PC Flanged Tube	03115	Closure	03266	PP Snap-On
		Adapter	00402	1 Place/Adapter
Nalgene PC Oak Ridge Tube	3138-10	Closure	Included	PA Sealing
		Adapter	00425	1 Place/Adapter
Nalgene PP	3139-10	Closure	Included	PA Sealing
		Adapter	00425	1 Place/Adapter
PP Oak Ridge Tube	03929	Closure	03279	PP Snap-On
		Adapter	00425	1 Place/Adapter
PC Oak Ridge Tube	03020	Closure	03279	PP Sealing
		Adapter	00425	1 Place/Adapter
PC Flanged Tube	03120	Closure	03265	PP Snap-On
		Adapter	00473	1 Place/Adapter
PP Flanged Tube	03121	Closure	03265	PP Snap-On
		Adapter	00473	1 Place/Adapter
PP Flanged Tube	03105	Closure	03264	PP Snap-On
		Adapter	00381	1 Place/Adapter
PC Flanged Tubes	03104	Closure	03264	PP Snap-On
		Adapter	00381	2 Places/Adapter
GL Pyrex® Tubes	03100	Adapter	00364	2 Places/Adapter
Conical Microtube	314352H01	Adapter	00381	2 Places/Adapter
Conical Microtube	–	Adapter	00381	2 Places/Adapter
CAB (Cellulose Acetate Butyrate) Tube	03103	Adapter	00408	4 Places/Adapter

Thermo Scientific Auto-Lock Rotor Exchange

Contents

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.

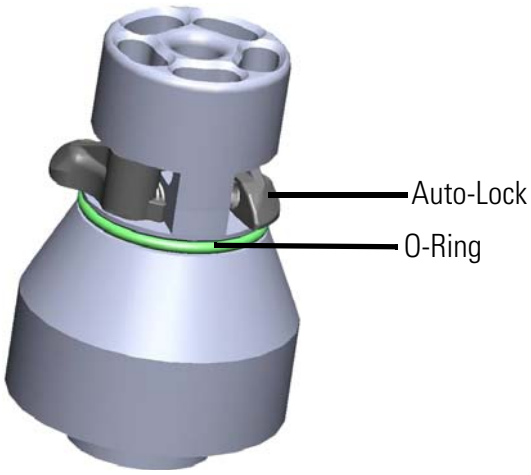


Figure 2-1. Auto-Lock

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

Contents

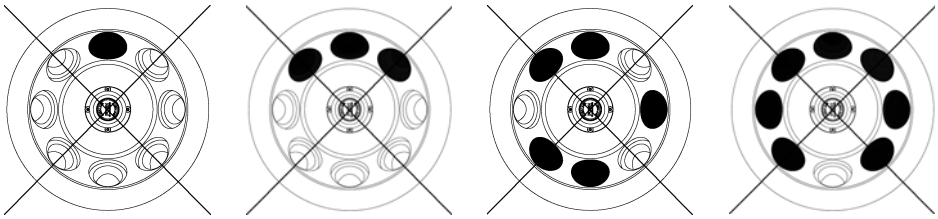
Before a Run

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-35.

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:

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

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

Contents

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.

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

Contents

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 or when soiled
Clean Rotor	Daily or when soiled
Accessories	Daily or when soiled

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 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.

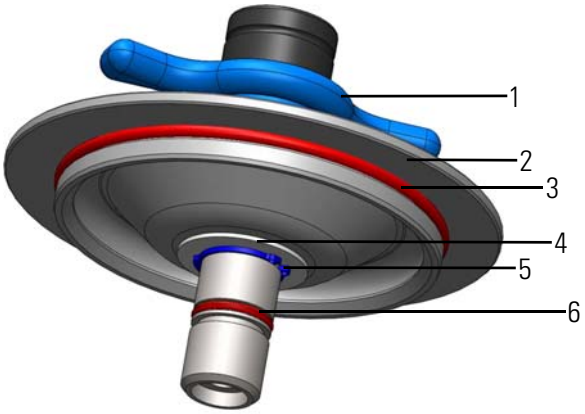
- After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (70009824). Also treat the rotor cavities with oil.
- Grease the seal (76003500).
- Grease the thread in the lid (75003786).

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.

Maintenance of O-Rings in Rotor Lid

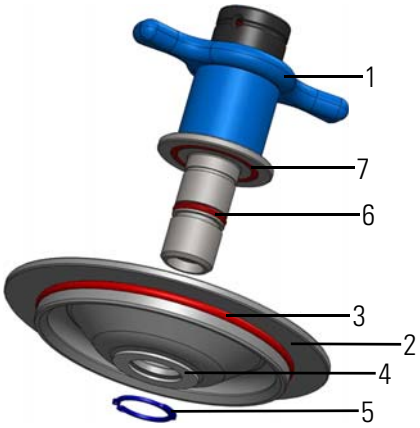
Note Check the O-ring when the rotor leaks and when autoclaving.

In order to maintain the O-rings (red in the drawings) you have to disassemble the rotor lid.



In order to reach O-rings you need a retaining ring plier (65614, shipped with rotor).

1. Hold the rotor lid with the lid knob (1) in your palm and the thread pointing upwards.
2. Insert the retaining ring plier (65614) in the eyes of the retaining ring (5).
3. Close the retaining ring plier (65614) and lift the retaining ring over the thread.



4. In order to remove the O-ring (6) in the threads push the O-ring on two opposing side so it will form a loop, which you then can use to remove the O-ring.

Note You can insert a paper-clip to the loop to lift the O-ring over the thread.

CAUTION Do not use any sharp items to remove the O-ring from the groove.

5. Control all the O-rings.

CAUTION O-rings that show signs of wear must be replaced.

6. Grease all the O-rings before inserting them again using the vacuum grease (76003500).
7. Place the O-rings back into their grooves.
   Use the staple again for O-ring (6).
8. Mount the rotor lid in reverse order.
9. Place the rotor plate (2) onto the thread.
10. Place the washer (4) onto the thread.
11. Hold the retaining ring (5) with the retaining ring plier (65614).
12. Open the retaining ring (5) and place it onto the thread until it has contact with the rotor plate (2).

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.

WARNING Before shipping or deposing centrifuges and accessories you have ton 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	3,3	10,7	9	30
600	3,3	10,7	13	43
700	3,3	10,7	18	59
800	3,3	10,7	24	77
900	3,3	10,7	30	97
1000	3,3	10,7	37	120
1100	3,3	10,7	45	145
1200	3,3	10,7	53	172
1300	3,3	10,7	62	202
1400	3,3	10,7	72	234
1500	3,3	10,7	83	269
1600	3,3	10,7	94	306
1700	3,3	10,7	107	346
1800	3,3	10,7	120	388
1900	3,3	10,7	133	432
2000	3,3	10,7	148	479
2100	3,3	10,7	163	528
2200	3,3	10,7	179	579
2300	3,3	10,7	195	633
2400	3,3	10,7	213	689
2500	3,3	10,7	231	748
2600	3,3	10,7	249	809
2700	3,3	10,7	269	872
2800	3,3	10,7	289	938
2900	3,3	10,7	310	1006
3000	3,3	10,7	332	1077
3100	3,3	10,7	355	1150
3200	3,3	10,7	378	1225

Speed rpm	R_{min}	R_{max}	RCF R_{min}	RCF R_{max}
3300	3,3	10,7	402	1303
3400	3,3	10,7	426	1383
3500	3,3	10,7	452	1465
3600	3,3	10,7	478	1550
3700	3,3	10,7	505	1638
3800	3,3	10,7	533	1727
3900	3,3	10,7	561	1820
4000	3,3	10,7	590	1914
4100	3,3	10,7	620	2011
4200	3,3	10,7	651	2110
4300	3,3	10,7	682	2212
4400	3,3	10,7	714	2316
4500	3,3	10,7	747	2422
4600	3,3	10,7	781	2531
4700	3,3	10,7	815	2643
4800	3,3	10,7	850	2756
4900	3,3	10,7	886	2872
5000	3,3	10,7	922	2991
5100	3,3	10,7	960	3111
5200	3,3	10,7	998	3235
5300	3,3	10,7	1036	3360
5400	3,3	10,7	1076	3488
5500	3,3	10,7	1116	3619
5600	3,3	10,7	1157	3751
5700	3,3	10,7	1199	3887
5800	3,3	10,7	1241	4024
5900	3,3	10,7	1284	4164
6000	3,3	10,7	1328	4307
6100	3,3	10,7	1373	4451
6200	3,3	10,7	1418	4598
6300	3,3	10,7	1464	4748
6400	3,3	10,7	1511	4900
6500	3,3	10,7	1559	5054
6600	3,3	10,7	1607	5211
6700	3,3	10,7	1656	5370
6800	3,3	10,7	1706	5532
6900	3,3	10,7	1757	5695

Speed rpm	R_{min}	R_{max}	RCF R_{min}	RCF R_{max}
7000	3,3	10,7	1808	5862
7100	3,3	10,7	1860	6030
7200	3,3	10,7	1913	6201
7300	3,3	10,7	1966	6375
7400	3,3	10,7	2020	6551
7500	3,3	10,7	2075	6729
7600	3,3	10,7	2131	6910
7700	3,3	10,7	2187	7093
7800	3,3	10,7	2245	7278
7900	3,3	10,7	2303	7466
8000	3,3	10,7	2361	7656
8100	3,3	10,7	2421	7849
8200	3,3	10,7	2481	8044
8300	3,3	10,7	2542	8241
8400	3,3	10,7	2603	8441
8500	3,3	10,7	2666	8643
8600	3,3	10,7	2729	8848
8700	3,3	10,7	2793	9054
8800	3,3	10,7	2857	9264
8900	3,3	10,7	2922	9476
9000	3,3	10,7	2988	9690
9100	3,3	10,7	3055	9906
9200	3,3	10,7	3123	10125
9300	3,3	10,7	3191	10346
9400	3,3	10,7	3260	10570
9500	3,3	10,7	3330	10796
9600	3,3	10,7	3400	11025
9700	3,3	10,7	3471	11256
9800	3,3	10,7	3543	11489
9900	3,3	10,7	3616	11725
10000	3,3	10,7	3689	11963
10100	3,3	10,7	3764	12203
10200	3,3	10,7	3838	12446
10300	3,3	10,7	3914	12691
10400	3,3	10,7	3990	12939
10500	3,3	10,7	4068	13189
10600	3,3	10,7	4145	13441

Speed rpm	R_{min}	R_{max}	RCF R_{min}	RCF R_{max}
10700	3,3	10,7	4224	13696
10800	3,3	10,7	4303	13953
10900	3,3	10,7	4383	14213
11000	3,3	10,7	4464	14475
11100	3,3	10,7	4546	14739
11200	3,3	10,7	4628	15006
11300	3,3	10,7	4711	15275
11400	3,3	10,7	4795	15547
11500	3,3	10,7	4879	15821
11600	3,3	10,7	4964	16097
11700	3,3	10,7	5050	16376
11800	3,3	10,7	5137	16657
11900	3,3	10,7	5225	16940
12000	3,3	10,7	5313	17226
12100	3,3	10,7	5402	17514
12200	3,3	10,7	5491	17805
12300	3,3	10,7	5582	18098
12400	3,3	10,7	5673	18394
12500	3,3	10,7	5765	18692
12600	3,3	10,7	5857	18992
12700	3,3	10,7	5951	19294
12800	3,3	10,7	6045	19600
12900	3,3	10,7	6140	19907
13000	3,3	10,7	6235	20217
13100	3,3	10,7	6331	20529
13200	3,3	10,7	6428	20844
13300	3,3	10,7	6526	21161
13400	3,3	10,7	6625	21480
13500	3,3	10,7	6724	21802
13600	3,3	10,7	6824	22126
13700	3,3	10,7	6925	22453
13800	3,3	10,7	7026	22782
13900	3,3	10,7	7128	23113
14000	3,3	10,7	7231	23447
14100	3,3	10,7	7335	23783
14200	3,3	10,7	7439	24121
14300	3,3	10,7	7544	24462

Speed rpm	R_{min}	R_{max}	RCF R_{min}	RCF R_{max}
14400	3,3	10,7	7650	24806
14500	3,3	10,7	7757	25151
14600	3,3	10,7	7864	25499
14700	3,3	10,7	7972	25850
14800	3,3	10,7	8081	26203
14900	3,3	10,7	8191	26558
15000	3,3	10,7	8301	26916
15100	3,3	10,7	8412	27276
15200	3,3	10,7	8524	27638
15300	3,3	10,7	8637	28003
15400	3,3	10,7	8750	28371
15500	3,3	10,7	8864	28740
15600	3,3	10,7	8979	29112
15700	3,3	10,7	9094	29487
15800	3,3	10,7	9210	29863
15900	3,3	10,7	9327	30243
16000	3,3	10,7	9445	30624
16100	3,3	10,7	9563	31008
16200	3,3	10,7	9682	31395
16300	3,3	10,7	9802	31783
16400	3,3	10,7	9923	32175
16500	3,3	10,7	10044	32568
16600	3,3	10,7	10167	32964
16700	3,3	10,7	10289	33362
16800	3,3	10,7	10413	33763
16900	3,3	10,7	10537	34166
17000	3,3	10,7	10662	34572
17100	3,3	10,7	10788	34980
17200	3,3	10,7	10915	35390
17300	3,3	10,7	11042	35803
17400	3,3	10,7	11170	36218
17500	3,3	10,7	11299	36635
17600	3,3	10,7	11428	37055
17700	3,3	10,7	11559	37478
17800	3,3	10,7	11689	37902
17900	3,3	10,7	11821	38329
18000	3,3	10,7	11954	38759

Speed rpm	R_{min}	R_{max}	RCF R_{min}	RCF R_{max}
18100	3,3	10,7	12087	39191
18200	3,3	10,7	12221	39625
18300	3,3	10,7	12355	40062
18400	3,3	10,7	12491	40501
18500	3,3	10,7	12627	40942
18600	3,3	10,7	12764	41386
18700	3,3	10,7	12901	41832
18800	3,3	10,7	13040	42281
18900	3,3	10,7	13179	42732
19000	3,3	10,7	13319	43185
19100	3,3	10,7	13459	43641
19200	3,3	10,7	13601	44099
19300	3,3	10,7	13743	44559
19400	3,3	10,7	13885	45022
19500	3,3	10,7	14029	45488
19600	3,3	10,7	14173	45956
19700	3,3	10,7	14318	46426
19800	3,3	10,7	14464	46898
19900	3,3	10,7	14610	47373
20000	3,3	10,7	14758	47850
20100	3,3	10,7	14906	48330
20200	3,3	10,7	15054	48812
20300	3,3	10,7	15204	49297
20400	3,3	10,7	15354	49784
20500	3,3	10,7	15505	50273
20600	3,3	10,7	15656	50764
20700	3,3	10,7	15809	51259
20800	3,3	10,7	15962	51755
20900	3,3	10,7	16116	52254
21000	3,3	10,7	16270	52755
21100	3,3	10,7	16426	53259
21200	3,3	10,7	16582	53765
21300	3,3	10,7	16738	54273
21400	3,3	10,7	16896	54784
21500	3,3	10,7	17054	55297
21600	3,3	10,7	17213	55813
21700	3,3	10,7	17373	56331

Speed rpm	R_{min}	R_{max}	RCF R_{min}	RCF R_{max}
21800	3,3	10,7	17534	56851
21900	3,3	10,7	17695	57374
22000	3,3	10,7	17857	57899
22100	3,3	10,7	18019	58427
22200	3,3	10,7	18183	58956
22300	3,3	10,7	18347	59489
22400	3,3	10,7	18512	60024
22500	3,3	10,7	18678	60561
22600	3,3	10,7	18844	61100
22700	3,3	10,7	19011	61642
22800	3,3	10,7	19179	62186
22900	3,3	10,7	19348	62733
23000	3,3	10,7	19517	63282
23100	3,3	10,7	19687	63834
23200	3,3	10,7	19858	64387
23300	3,3	10,7	20029	64944
23400	3,3	10,7	20202	65502
23500	3,3	10,7	20375	66063
23600	3,3	10,7	20548	66627
23700	3,3	10,7	20723	67193
23800	3,3	10,7	20898	67761
23900	3,3	10,7	21074	68332
24000	3,3	10,7	21251	68905
24100	3,3	10,7	21428	69480
24200	3,3	10,7	21607	70058
24300	3,3	10,7	21786	70638
24400	3,3	10,7	21965	71221
24500	3,3	10,7	22146	71806
24600	3,3	10,7	22327	72393
24700	3,3	10,7	22509	72983
24800	3,3	10,7	22691	73575
24900	3,3	10,7	22875	74169
25000	3,3	10,7	23059	74766
25100	3,3	10,7	23244	75366
25200	3,3	10,7	23429	75967
25300	3,3	10,7	23615	76571
25400	3,3	10,7	23803	77178

Speed rpm	R_{min}	R_{max}	RCF R_{min}	RCF R_{max}
25500	3,3	10,7	23990	77787
25600	3,3	10,7	24179	78398
25700	3,3	10,7	24368	79012
25800	3,3	10,7	24558	79628
25900	3,3	10,7	24749	80246
26000	3,3	10,7	24940	80867
26100	3,3	10,7	25133	81490
26200	3,3	10,7	25326	82116
26300	3,3	10,7	25519	82744
26400	3,3	10,7	25714	83375
26500	3,3	10,7	25909	84007
26600	3,3	10,7	26105	84643
26700	3,3	10,7	26301	85280
26800	3,3	10,7	26499	85920
26900	3,3	10,7	26697	86563
27000	3,3	10,7	26896	87207
27100	3,3	10,7	27095	87855
27200	3,3	10,7	27296	88504
27300	3,3	10,7	27497	89156
27400	3,3	10,7	27699	89810
27500	3,3	10,7	27901	90467
27600	3,3	10,7	28104	91126
27700	3,3	10,7	28308	91788
27800	3,3	10,7	28513	92452
27900	3,3	10,7	28719	93118
28000	3,3	10,7	28925	93787
28100	3,3	10,7	29132	94458
28200	3,3	10,7	29340	95131
28300	3,3	10,7	29548	95807
28400	3,3	10,7	29757	96486
28500	3,3	10,7	29967	97166
28600	3,3	10,7	30178	97849
28700	3,3	10,7	30389	98535
28800	3,3	10,7	30601	99223
28900	3,3	10,7	30814	99913
29000	3,3	10,7	31028	100605

Rotor Care Guide

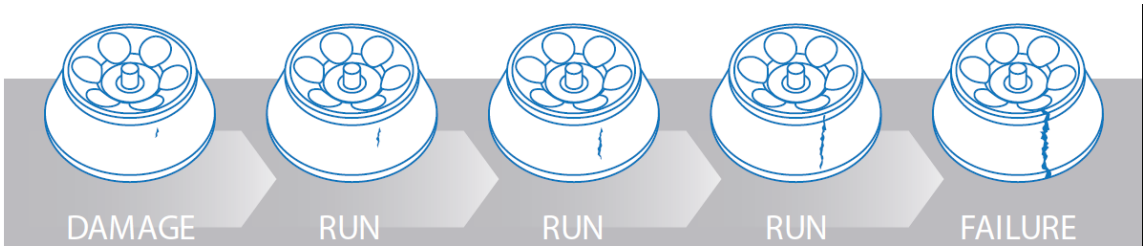
Contents

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 onan 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	• 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	• 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)	• Gently place rotor on the centrifuge spindle. Clean with non-abrasive cloth and mild detergent. • 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	• 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)	• 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	• 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	• 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	• Lubricate buckets regularly. • Slide buckets into place carefully to avoid dropping or forcing into position.	Replace rotor bucket set.
Windshield damage	• 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	• 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	• 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	• Inspect before every use.	Return rotor to manufacturer for evaluation or replacement.
Septa damage in continuous flow or zonal rotor	• 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	• Avoid banging or dropping. • Never use metallic objects to remove debris.	Monitor to ensure no corrosion has occurred.
Bent centrifuge spindle	• 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	DELRIN	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL	NYLON	PET[1], POLYCLEAR, CLEARCRIMP	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYTHERMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A, TEFLON	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON	VITON
2-mercaptoethanol		S	S	U	-	S	M	S	-	S	U	S	S	U	S	S	-	S	S	S	S	U	S	S	S	S	S	S
Acetaldehyde		S	-	U	U	-	-	-	M	-	U	-	-	-	M	U	U	U	M	M	-	M	S	U	-	S	-	U
Acetone		M	S	U	U	S	U	M	S	S	U	U	S	U	S	U	U	U	S	S	U	U	S	M	M	S	U	U
Acetonitrile		S	S	U	-	S	M	S	-	S	S	U	S	U	M	U	U	-	S	M	U	U	S	S	S	S	U	U
Alconox		U	U	S	-	S	S	S	-	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	U
Allyl Alcohol		-	-	-	U	-	-	S	-	-	-	-	S	-	S	S	M	S	S	S	-	M	S	-	-	S	-	-
Aluminum Chloride		U	U	S	S	S	S	U	S	S	S	S	M	S	S	S	S	-	S	S	S	S	S	M	U	U	S	S
Formic Acid (100 %)		-	S	M	U	-	-	U	-	-	-	-	U	-	S	M	U	U	S	S	-	U	S	-	U	S	-	U
Ammonium Acetate		S	S	U	-	S	S	S	-	S	S	S	S	S	S	S	U	-	S	S	S	S	S	S	S	S	S	S
Ammonium Carbonate		M	S	U	S	S	S	S	S	S	S	S	S	S	S	U	U	-	S	S	S	S	S	S	M	S	S	S
Ammonium Hydroxide (10 %)		U	U	S	U	S	S	M	S	S	S	S	S	-	S	U	M	S	S	S	S	S	S	S	S	S	M	S
Ammonium Hydroxide (28 %)		U	U	S	U	S	U	M	S	S	S	S	S	U	S	U	M	S	S	S	S	S	S	S	S	S	M	S
Ammonium Hydroxide (conc.)		U	U	U	U	S	U	M	S	-	S	-	S	U	S	U	U	S	S	S	-	M	S	S	S	S	-	U
Ammonium Phosphate		U	-	S	-	S	S	S	S	S	S	S	S	-	S	S	M	-	S	S	S	S	S	S	M	S	S	S
Ammonium Sulfate		U	M	S	-	S	S	U	S	S	S	S	S	S	S	S	S	-	S	S	S	S	S	S	U	S	S	U
Amyl Alcohol		S	-	M	U	-	-	S	S	-	M	-	S	-	M	S	S	S	S	M	-	-	-	U	-	S	-	M
Aniline		S	S	U	U	S	U	S	M	S	U	U	U	U	U	U	U	-	S	M	U	U	S	S	S	S	U	S
Sodium Hydroxide (<1 %)		U	-	M	S	S	S	-	-	S	M	S	S	-	S	M	M	S	S	S	S	S	S	M	S	S	-	U
Sodium Hydroxide (10 %)		U	-	M	U	-	-	U	-	M	M	S	S	U	S	U	U	S	S	S	S	S	S	M	S	S	-	U
Barium Salts		M	U	S	-	S	S	S	S	S	S	S	S	S	S	S	M	-	S	S	S	S	S	S	M	S	S	S
Benzene		S	S	U	U	S	U	M	U	S	U	U	S	U	U	U	M	U	M	U	U	U	S	U	U	S	U	S
Benzyl Alcohol		S	-	U	U	-	-	M	M	-	M	-	S	U	U	U	U	U	U	U	-	M	S	M	-	S	-	S
Boric Acid		U	S	S	M	S	S	U	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S
Cesium Acetate		M	-	S	-	S	S	S	-	S	S	S	S	-	S	S	-	-	S	S	S	S	S	S	M	S	S	S

CHEMICAL	MATERIAL	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL	NYLON	PET[1], POLYCLEAR, CLEARCRIMP	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYTHERMIDE	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	S	U	U
Dioxane		M	S	U	U	S	S	M	M	S	U	U	S	U	M	U	U	-	M	M	M	U	S	S	S	S	U	U
Ferric Chloride		U	U	S	-	-	-	M	S	-	M	-	S	-	S	-	-	-	S	S	-	-	-	M	U	S	-	S
Acetic Acid (Glacial)		S	S	U	U	S	S	U	M	S	U	S	U	U	U	U	U	M	S	U	M	U	S	U	U	S	-	U
Acetic Acid (5 %)		S	S	M	S	S	S	M	S	S	S	S	S	M	S	S	S	S	S	S	S	M	S	S	M	S	S	M
Acetic Acid (60 %)		S	S	U	U	S	S	U	-	S	M	S	U	U	M	U	S	M	S	M	S	M	S	M	U	S	M	U
Ethyl Acetate		M	M	U	U	S	S	M	M	S	S	U	S	U	M	U	U	-	S	S	U	U	S	M	M	S	U	U
Ethyl Alcohol (50 %)		S	S	S	S	S	S	M	S	S	S	S	S	U	S	U	S	S	S	S	S	S	S	S	M	S	M	U
Ethyl Alcohol (95 %)		S	S	S	U	S	S	M	S	S	S	S	S	U	S	U	-	S	S	S	M	S	S	S	U	S	M	U
Ethylene Dichloride		S	-	U	U	-	-	S	M	-	U	U	S	U	U	U	U	U	U	U	-	U	S	U	-	S	-	S
Ethylene Glycol		S	S	S	S	S	S	S	S	S	S	S	S	-	S	U	S	S	S	S	S	S	S	S	M	S	M	S
Ethylene Oxide Vapor		S	-	U	-	-	U	-	-	S	U	-	S	-	S	M	-	-	S	S	S	U	S	U	S	S	S	U
Ficoll-Hypaque		M	S	S	-	S	S	S	-	S	S	S	S	-	S	S	-	S	S	S	S	S	S	S	M	S	S	S
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	POLYTHERMIDE	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

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	POLYTHERMIDE	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	S	M	S	S	S
Oils (Petroleum)		S	S	S	-	-	-	S	U	S	S	S	S	U	U	M	S	M	U	U	S	S	S	U	S	S	S	S
Oils (Other)		S	-	S	-	-	-	S	M	S	S	S	S	U	S	S	S	S	U	S	S	S	S	-	S	S	M	S
Oleic Acid		S	-	U	S	S	S	U	U	S	U	S	S	M	S	S	S	S	S	S	S	S	S	M	U	S	M	M
Oxalic Acid		U	U	M	S	S	S	U	S	S	S	S	S	U	S	U	S	S	S	S	S	S	S	S	U	M	S	S
Perchloric Acid (10 %)		U	-	U	-	S	U	U	-	S	M	M	-	-	M	U	M	S	M	M	-	M	S	U	-	S	-	S
Perchloric Acid (70 %)		U	U	U	-	-	U	U	-	S	U	M	U	U	M	U	U	U	M	M	U	M	S	U	U	S	U	S
Phenol (5 %)		U	S	U	-	S	M	M	-	S	U	M	U	U	S	U	M	S	M	S	U	U	S	U	M	M	M	S
Phenol (50 %)		U	S	U	-	S	U	M	-	S	U	M	U	U	U	U	U	S	U	M	U	U	S	U	U	U	M	S
Phosphoric Acid (10 %)		U	U	M	S	S	S	U	S	S	S	S	U	-	S	S	S	S	S	S	S	S	S	U	M	U	S	S
Phosphoric Acid (conc.)		U	U	M	M	-	-	U	S	-	M	S	U	U	M	M	S	S	S	M	S	M	S	U	M	U	-	S
Physiologic Media (Serum, Urine)		M	S	S	S	-	-	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Picric Acid		S	S	U	-	S	M	S	S	S	M	S	U	S	S	S	U	S	S	S	S	U	S	U	M	S	M	S
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	POLYTHERMIDE	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

[1]Polyethyleneterephthalate

Key

S Satisfactory

M Moderate attack, may be satisfactory for use in centrifuge depending on length of exposure, speed involved, etc. Suggest testing under actual conditions of use.

U Unsatisfactory, not recommended.

-- Performance unknown; suggest testing, using sample to avoid loss of valuable material.

Chemical resistance data is included only as a guide to product use. No organized chemical resistance data exists for materials under the stress of centrifugation. When in doubt we recommend pretesting sample lots.

Index

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+358 10 329 2200
Russia +7 812 703 42 15, +7 495 739 76 41
Singapore +82 2 3420 8700
Spain/Portugal +34 93 223 09 18
Switzerland +41 44 454 12 12
UK/Ireland +44 870 609 9203
USA/Canada +1 866 984 3766
Other Asian Countries +852 3107 7600
Countries not listed +49 6184 90 6000

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50137995 is the original instruction manual.

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