



Thermo Fisher Scientific

BIOShield™ 720

Instruction Manual

50121034-3

October 2009

© 2009 Thermo Fisher Scientific Inc. All rights reserved.

AutoLock™ und BIOShield™ 720 are either registered trademarks or trademarks of Thermo Fisher Scientific.

All other trademarks are the property of Thermo Fisher Scientific Inc. and its subsidiaries.

Thermo Fisher Scientific Inc. provides this document to its customers with a product purchase to use in the product operation. This document is copyright protected and any reproduction of the whole or any part of this document is strictly prohibited, except with the written authorization of Thermo Fisher Scientific Inc.

The contents of this document are subject to change without notice. All technical information in this document is for reference purposes only. System configurations and specifications in this document supersede all previous information received by the purchaser.

Thermo Fisher Scientific Inc. makes no representations that this document is complete, accurate or error-free and assumes no responsibility and will not be liable for any errors, omissions, damage or loss that might result from any use of this document, even if the information in the document is followed properly.

This document is not part of any sales contract between Thermo Fisher Scientific Inc. and a purchaser. This document shall in no way govern or modify any Terms and Conditions of Sale, which Terms and Conditions of Sale shall govern all conflicting information between the two documents.

Release history: 50121034-3 printed in October 2009.

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



Certificate of Containment Testing

Containment Testing of contained Bioshield 720 Thermo Scientific rotor 75003621

Report No. 77- 08 F

Report prepared for: Thermo Fisher
Issue Date: 1st June 2009

Test Summary

A Thermo Scientific 75003621 contained Bioshield 720 rotor (Max speed 6,300 rpm) was supplied by Thermo Fisher and containment tested at 6,300 rpm using the method described in Annex AA of EN 61010-2-020. The rotor was shown to contain a spill when tested in triplicate.

Report Written By

A blue ink signature of Mark Spent, written over a horizontal dashed line.

Report Authorised By

A blue ink signature, written over a horizontal dashed line.

Table of Contents

| | |
|---|------------|
| Preface | iii |
| Scope of Supply | iii |
| Precautions | iii |
| Chapter 1 Rotor Specifications | 1-1 |
| Heraeus | 1-2 |
| Heraeus 230V 50Hz/60Hz ventilated | 1-2 |
| Heraeus 230V 50Hz/60Hz refrigerated | 1-2 |
| Heraeus 120V 60Hz ventilated | 1-3 |
| Heraeus 120V 60Hz refrigerated | 1-3 |
| Sorvall | 1-4 |
| Sorvall 230V 50Hz/60Hz ventilated | 1-4 |
| Sorvall 230V 50Hz/60Hz refrigerated | 1-4 |
| Sorvall 120V 60Hz ventilated | 1-5 |
| Sorvall 120V 60Hz refrigerated | 1-5 |
| Sorvall 100V 50/60Hz ventilated | 1-6 |
| Sorvall 100V 50/60Hz refrigerated | 1-6 |
| Thermo Scientific | 1-7 |
| Thermo Scientific 230V 50Hz/60Hz ventilated | 1-7 |
| Thermo Scientific 230V 50Hz/60Hz refrigerated | 1-7 |
| Thermo Scientific 120V 60Hz ventilated | 1-8 |
| Thermo Scientific 120V 60Hz refrigerated | 1-8 |
| Chapter 2 Accessories | 2-1 |
| Chapter 3 AutoLock™ | 3-1 |
| Rotor Installation | 3-2 |
| Removing the Rotor | 3-3 |
| Chapter 4 Rotor Loading | 4-1 |
| Before a Run | 4-2 |
| Proper Loading | 4-2 |
| Improper Loading | 4-3 |
| Maximum Loading | 4-3 |
| Cycle Counter | 4-4 |
| Chapter 5 Aerosol-tight Applications | 5-1 |
| Basic Principles | 5-2 |
| Placing O-ring | 5-2 |
| Fill Level | 5-2 |
| Checking the Aerosol-Tightness | 5-2 |

| | | |
|------------------|---|------------|
| Chapter 6 | Maintenance and Care | 6-1 |
| | Cleaning intervalls | 6-2 |
| | Cleaning | 6-2 |
| | Disinfection | 6-3 |
| | Decontamination | 6-4 |
| | Autoclaving | 6-5 |
| | Service of Thermo Fisher Scientific | 6-6 |
| | RCF-Values | A-1 |
| | Chemical Compatibility Chart | B-1 |
| | Contact Information | C-1 |

Preface

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

The information contained in these 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 seller's warranty.

Scope of Supply

| Article Number | | Quantity | Check |
|----------------|--------------------|----------|--------------------------|
| 75003621 | BIOShield™ 720 | 1 | <input type="checkbox"/> |
| 76003500 | Rubber seal grease | 1 | <input type="checkbox"/> |
| 7500 786 | Bolt grease | 1 | <input type="checkbox"/> |
| 50121034 | Instruction Manual | 1 | <input type="checkbox"/> |

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

Precautions

In order to ensure safe operation of the BIOShield™ 720, 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.
- Never run the rotor without lid.

Preface

- 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:

- 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: $1.2 \frac{g}{cm^3}$



This symbol refers to general hazards.
ATTENTION 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.

Rotor Specifications

Contents

- “Heraeus” on page 1-2
- “Sorvall” on page 1-4
- “Thermo Scientific” on page 1-7

Heraeus

Table 1-1. Heraeus 230V 50Hz/60Hz ventilated

| Centrifuge | Heraeus Multifuge X1 | Heraeus Megafuge 16 |
|---|----------------------|---------------------|
| Catalog # | 75004210 | 75004230 |
| Weight of empty rotor [kg] | 5.7 | 5.7 |
| Max. cycle number | 66,000 | 66,000 |
| Maximum permissible load [g] | 4x470 | 4x470 |
| Maximum speed n_{max} [rpm] | 6,300 | 5,300 |
| Maximum RCF value at n_{max} | 7,188 | 5,088 |
| Max. / min. radius [cm] | 16.2 / 6.7 | 16.2 / 6.7 |
| Pitch angle [°] | 90 | 90 |
| Accel. / braking time [s] | 65 / 65 | 45 / 50 |
| Sample heating at n_{max} [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 16 | 9 |
| Aerosol-tight * | yes | yes |
| Permissible temperature range autoclavable °C | 121 | 121 |

*Tested by HPA, Porton-down, UK

Table 1-2. Heraeus 230V 50Hz/60Hz refrigerated

| Centrifuge | Heraeus Multifuge X1R | Heraeus Megafuge 16R |
|---|-----------------------|----------------------|
| Catalog # | 75004250 | 75004270 |
| Weight of empty rotor [kg] | 5.7 | 5.7 |
| Max. cycle number | 66,000 | 66,000 |
| Maximum permissible load [g] | 4x470 | 4x470 |
| Maximum speed n_{max} [rpm] | 6,300 | 5,300 |
| Maximum RCF value at n_{max} | 7,188 | 5,088 |
| Max. / min. radius [cm] | 16.2 / 6.7 | 16.2 / 6.7 |
| Pitch angle [°] | 90 | 90 |
| Accel. / braking time [s] | 65 / 65 | 45 / 50 |
| Aerosol-tight * | yes | yes |
| Permissible temperature range autoclavable °C | 121 | 121 |

*Tested by HPA, Porton-down, UK

Table 1-3. Heraeus 120V 60Hz ventilated

| Centrifuge | Heraeus Multifuge X1 | Heraeus Megafuge 16 |
|---|-----------------------------|----------------------------|
| Catalog # | 75004211 | 75004231 |
| Weight of empty rotor [kg] | 5.7 | 5.7 |
| Max. cycle number | 66,000 | 66,000 |
| Maximum permissible load [g] | 4x470 | 4x470 |
| Maximum speed n_{max} [rpm] | 6,300 | 5,300 |
| Maximum RCF value at n_{max} | 7,188 | 5,088 |
| Max. / min. radius [cm] | 16.2 / 6.7 | 16.2 / 6.7 |
| Pitch angle [°] | 90 | 90 |
| Accel. / braking time [s] | 75 / 70 | 55 / 50 |
| Sample heating at n_{max} [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 16 | 9 |
| Aerosol-tight * | yes | yes |
| Permissible temperature range autoclavable °C | 121 | 121 |

*Tested by HPA, Porton-down, UK

Table 1-4. Heraeus 120V 60Hz refrigerated

| Centrifuge | Heraeus Multifuge X1R | Heraeus Megafuge 16R |
|---|------------------------------|-----------------------------|
| Catalog # | 75004251 | 75004271 |
| Weight of empty rotor [kg] | 5.7 | 5.7 |
| Max. cycle number | 66,000 | 66,000 |
| Maximum permissible load [g] | 4x470 | 4x470 |
| Maximum speed n_{max} [rpm] | 6,300 | 5,300 |
| Maximum RCF value at n_{max} | 7,188 | 5,088 |
| Max. / min. radius [cm] | 16.2 / 6.7 | 16.2 / 6.7 |
| Pitch angle [°] | 90 | 90 |
| Accel. / braking time [s] | 75 / 70 | 55 / 50 |
| Aerosol-tight * | yes | yes |
| Permissible temperature range autoclavable °C | 121 | 121 |

*Tested by HPA, Porton-down, UK

1 Rotor Specifications

Sorvall

Sorvall

Table 1-5. Sorvall 230V 50Hz/60Hz ventilated

| Centrifuge | Sorvall Legend X1 | Sorvall ST 16 |
|--|-------------------|---------------|
| Catalog # | 75004220 | 75004240 |
| Weight of empty rotor [kg] | 5.7 | 5.7 |
| Max. cycle number | 66,000 | 66,000 |
| Maximum permissible load [g] | 4x470 | 4x470 |
| Maximum speed n_{\max} [rpm] | 6,300 | 5,300 |
| Maximum RCF value at n_{\max} | 7,188 | 5,088 |
| Max. / min. radius [cm] | 16.2 / 6.7 | 16.2 / 6.7 |
| Pitch angle [°] | 90 | 90 |
| Accel. / braking time [s] | 65 / 65 | 45 / 50 |
| Sample heating at n_{\max} [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 16 | 9 |
| Aerosol-tight * | yes | yes |
| Permissible temperature range autoclavable °C | 121 | 121 |

*Tested by HPA, Porton-down, UK

Table 1-6. Sorvall 230V 50Hz/60Hz refrigerated

| Centrifuge | Sorvall Legend X1R | Sorvall ST 16R |
|---|--------------------|----------------|
| Catalog # | 75004260 | 75004380 |
| Weight of empty rotor [kg] | 5.7 | 5.7 |
| Max. cycle number | 66,000 | 66,000 |
| Maximum permissible load [g] | 4x470 | 4x470 |
| Maximum speed n_{\max} [rpm] | 6,300 | 5,300 |
| Maximum RCF value at n_{\max} | 7,188 | 5,088 |
| Max. / min. radius [cm] | 16.2 / 6.7 | 16.2 / 6.7 |
| Pitch angle [°] | 90 | 90 |
| Accel. / braking time [s] | 65 / 65 | 45 / 50 |
| Aerosol-tight * | yes | yes |
| Permissible temperature range autoclavable °C | 121 | 121 |

*Tested by HPA, Porton-down, UK

Table 1-7. Sorvall 120V 60Hz ventilated

| Centrifuge | Sorvall Legend X1 | Sorvall ST 16 |
|---|--------------------------|----------------------|
| Catalog # | 75004221 | 75004241 |
| Weight of empty rotor [kg] | 5.7 | 5.7 |
| Max. cycle number | 66,000 | 66,000 |
| Maximum permissible load [g] | 4x470 | 4x470 |
| Maximum speed n_{max} [rpm] | 6,300 | 5,300 |
| Maximum RCF value at n_{max} | 7,188 | 5,088 |
| Max. / min. radius [cm] | 16.2 / 6.7 | 16.2 / 6.7 |
| Pitch angle [°] | 90 | 90 |
| Accel. / braking time [s] | 75 / 70 | 55 / 50 |
| Sample heating at n_{max} [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 16 | 9 |
| Aerosol-tight * | yes | yes |
| Permissible temperature range autoclavable °C | 121 | 121 |

*Tested by HPA, Porton-down, UK

Table 1-8. Sorvall 120V 60Hz refrigerated

| Centrifuge | Sorvall Legend X1R | Sorvall ST 16R |
|---|---------------------------|-----------------------|
| Catalog # | 75004261 | 75004381 |
| Weight of empty rotor [kg] | 5.7 | 5.7 |
| Max. cycle number | 66,000 | 66,000 |
| Maximum permissible load [g] | 4x470 | 4x470 |
| Maximum speed n_{max} [rpm] | 6,300 | 5,300 |
| Maximum RCF value at n_{max} | 7,188 | 5,088 |
| Max. / min. radius [cm] | 16.2 / 6.7 | 16.2 / 6.7 |
| Pitch angle [°] | 90 | 90 |
| Accel. / braking time [s] | 75 / 70 | 55 / 50 |
| Aerosol-tight * | yes | yes |
| Permissible temperature range autoclavable °C | 121 | 121 |

*Tested by HPA, Porton-down, UK

1 Rotor Specifications

Sorvall

Table 1-9. Sorvall 100V 50/60Hz ventilated

| Centrifuge | Sorvall Legend X1 | Sorvall ST 16 |
|--|-------------------|---------------|
| Catalog # | 75004223 | 75004243 |
| Weight of empty rotor [kg] | 5.7 | 5.7 |
| Max. cycle number | 66,000 | 66,000 |
| Maximum permissible load [g] | 4x470 | 4x470 |
| Maximum speed n_{\max} [rpm] | 6,300 | 5,300 |
| Maximum RCF value at n_{\max} | 7,188 | 5,088 |
| Max. / min. radius [cm] | 16.2 / 6.7 | 16.2 / 6.7 |
| Pitch angle [°] | 90 | 90 |
| Accel. / braking time [s] | 75 / 70 | 55 / 50 |
| Sample heating at n_{\max} [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 16 | 9 |
| Aerosol-tight * | yes | yes |
| Permissible temperature range autoclavable °C | 121 | 121 |

*Tested by HPA, Porton-down, UK

Table 1-10. Sorvall 100V 50/60Hz refrigerated

| Centrifuge | Sorvall Legend X1R | Sorvall ST 16R |
|---|--------------------|----------------|
| Catalog # | 75004263 | 75004283 |
| Weight of empty rotor [kg] | 5.7 | 5.7 |
| Max. cycle number | 66,000 | 66,000 |
| Maximum permissible load [g] | 4x470 | 4x470 |
| Maximum speed n_{\max} [rpm] | 6,300 | 5,300 |
| Maximum RCF value at n_{\max} | 7,188 | 5,088 |
| Max. / min. radius [cm] | 16.2 / 6.7 | 16.2 / 6.7 |
| Pitch angle [°] | 90 | 90 |
| Accel. / braking time [s] | 75 / 70 | 55 / 50 |
| Aerosol-tight * | yes | yes |
| Permissible temperature range autoclavable °C | 121 | 121 |

*Tested by HPA, Porton-down, UK

Thermo Scientific

Table 1-11. Thermo Scientific 230V 50Hz/60Hz ventilated

| Centrifuge | Thermo Scientific SL 16 |
|---|-------------------------|
| Catalog # | 75004000 |
| Weight of empty rotor [kg] | 5.7 |
| Max. cycle number | 66,000 |
| Maximum permissible load [g] | 4x470 |
| Maximum speed n_{max} [rpm] | 5,300 |
| Maximum RCF value at n_{max} | 5,088 |
| Max. / min. radius [cm] | 16.2 / 6.7 |
| Pitch angle [°] | 90 |
| Accel. / braking time [s] | 45 / 50 |
| Sample heating at n_{max} [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 9 |
| Aerosol-tight * | yes |
| Permissible temperature range autoclavable °C | 121 |

*Tested by HPA, Porton-down, UK

Table 1-12. Thermo Scientific 230V 50Hz/60Hz refrigerated

| Centrifuge | Thermo Scientific SL 16R |
|---|--------------------------|
| Catalog # | 75004030 |
| Weight of empty rotor [kg] | 5.7 |
| Max. cycle number | 66,000 |
| Maximum permissible load [g] | 4x470 |
| Maximum speed n_{max} [rpm] | 5,300 |
| Maximum RCF value at n_{max} | 5,088 |
| Max. / min. radius [cm] | 16.2 / 6.7 |
| Pitch angle [°] | 90 |
| Accel. / braking time [s] | 45 / 50 |
| Aerosol-tight * | yes |
| Permissible temperature range autoclavable °C | 121 |

*Tested by HPA, Porton-down, UK

1 Rotor Specifications

Thermo Scientific

Table 1-13. Thermo Scientific 120V 60Hz ventilated

| Centrifuge | Thermo Scientific SL 16 |
|--|-------------------------|
| Catalog # | 75004001 |
| Weight of empty rotor [kg] | 5.7 |
| Max. cycle number | 66,000 |
| Maximum permissible load [g] | 4x470 |
| Maximum speed n_{\max} [rpm] | 5,300 |
| Maximum RCF value at n_{\max} | 5,088 |
| Max. / min. radius [cm] | 16.2 / 6.7 |
| Pitch angle [°] | 90 |
| Accel. / braking time [s] | 55 / 50 |
| Sample heating at n_{\max} [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 9 |
| Aerosol-tight * | yes |
| Permissible temperature range autoclavable °C | 121 |

*Tested by HPA, Porton-down, UK

Table 1-14. Thermo Scientific 120V 60Hz refrigerated

| Centrifuge | Thermo Scientific SL 16R |
|---|--------------------------|
| Catalog # | 75004031 |
| Weight of empty rotor [kg] | 5.7 |
| Max. cycle number | 66,000 |
| Maximum permissible load [g] | 4x470 |
| Maximum speed n_{\max} [rpm] | 5,300 |
| Maximum RCF value at n_{\max} | 5,088 |
| Max. / min. radius [cm] | 16.2 / 6.7 |
| Pitch angle [°] | 90 |
| Accel. / braking time [s] | 55 / 50 |
| Aerosol-tight * | yes |
| Permissible temperature range autoclavable °C | 121 |

*Tested by HPA, Porton-down, UK

Accessories

Contents

- „Rotor data“ on page 2-2
- „Accessories“ on page 2-2

Thermo Scientific General Purpose Rotors

BIOShield 720

BIOShield 720 Swinging Bucket Sealed Rotor



| Rotor Specifications | |
|---|----------------------------|
| Capacity (ml) | 4 x 180 |
| Tube Dimensions (mm) | 56 x 123 |
| Angle ° | 90 |
| Maximum Speed (rpm) | 6300* |
| K Factor | 5627 |
| Net Weight (kg) | 5.7 |
| * Max Speed varies depending on model of centrifuge | |
| RCF/Radius | RCF (x g) Radius (cm) |
| Maximum | 7,1880 16.2 |
| Minimum | 2,9700 6.7 |



BIOShield 720 Rotor Package

| Cat. No. | Description |
|----------|--|
| 75003621 | BIOShield 720 with buckets and sealing lid |

Tube Ordering Information

| Cat. No. | Tube Vol. (ml) | Vol. Fill (ml) | Description | Qty. | Max. Speed (rpm) | Dims ØxL (mm) | Sealing Assembly Required: | | | Adapters Required: | | | Accessories Required: | | |
|----------|----------------|----------------|----------------------------|------|------------------|---------------|----------------------------|----------|-------------|--------------------|----------|---------------|-----------------------|---|--|
| | | | | | | | Cat. No. | Qty /Pkg | Description | Cat. No. | Qty /Pkg | No. of Places | | | |
| 75003800 | 180 | 180 | PP Screw Cap Bottle | 12 | 6,300 | 56 x 123 | Included | 12 | PP Sealing | 75003693 | 2 | 1 | - | - | |
| - | 150 | - | Round Bottom Open Top Tube | - | - | 50 x 122 | - | - | - | 75003813 | 2 | 1 | - | - | |
| 76009007 | 100 | 75 | Glass Bottle | 10 | - | 44 x 120 | - | - | - | 75003814 | 2 | 1 | - | - | |
| 76009084 | 100 | 75 | PP Bottle | 1 | 6,300 | 45x98 | - | - | - | 75003814 | 2 | 1 | - | - | |
| 76009095 | 100 | 75 | PC Bottle | 1 | 6,300 | 45x98 | - | - | - | 75003814 | 2 | 1 | - | - | |
| 334959 | 50 | 50 | Nunc Conical | 25 | 6,300 | 29,5 x 116 | Included | 25 | PP Sealing | 75003677 | 2 | 2 | - | - | |
| - | 50 | - | Round Bottom Open Top Tube | - | - | 34 x 120 | - | - | - | 75003816 | 2 | 2 | - | - | |
| - | 25 | - | Universal | - | - | 22,5 x 105 | - | - | - | 75003818 | 2 | 4 | - | - | |
| - | 25 | - | DIN Round Bottom Tube | - | - | 25 x 107 | - | - | - | 75003817 | 2 | 5 | - | - | |
| 366036 | 15 | 15 | Nunc Conical | 50 | 6,300 | 16,5 x 121 | Included | 50 | PP Sealing | 75003678 | 2 | 6 | - | - | |
| - | 15 | - | Blood Collection | - | - | 17x109 | - | - | - | 75003820 | 2 | 11 | - | - | |
| - | 10 | - | Blood Collection | - | - | 17x109 | - | - | - | 75003820 | 2 | 11 | - | - | |
| - | 7 | - | Blood Collection | - | - | 13 x 115 | - | - | - | 75003821 | 2 | 12 | - | - | |
| - | 5 | - | Blood Collection | - | - | 13 x 115 | - | - | - | 75003821 | 2 | 12 | - | - | |
| - | 5 | - | RIA or Round | - | - | 13 x 115 | - | - | - | 75003822 | 2 | 20 | - | - | |
| - | 2 | - | Conical Microtube | - | - | 11 x 45 | - | - | - | 75003823 | 2 | 40 | - | - | |
| - | 1,5 | - | Conical Microtube | - | - | 11 x 45 | - | - | - | 75003823 | 2 | 40 | - | - | |

AutoLock™

Contents

- “Rotor Installation” on page 3-2
- “Removing the Rotor” on page 3-3

Rotor Installation



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

This rotor is equipped with an AutoLock™-system.

This system is used to automatically lock the rotor to the centrifuge spindle. The rotor does not have to be bolted onto the centrifuge spindle.

Proceed as follows:

1. Open the lid of the centrifuge and if necessary remove any dust, foreign objects or residue from the chamber.
AutoLock™ and o-ring must be clean and undamaged.

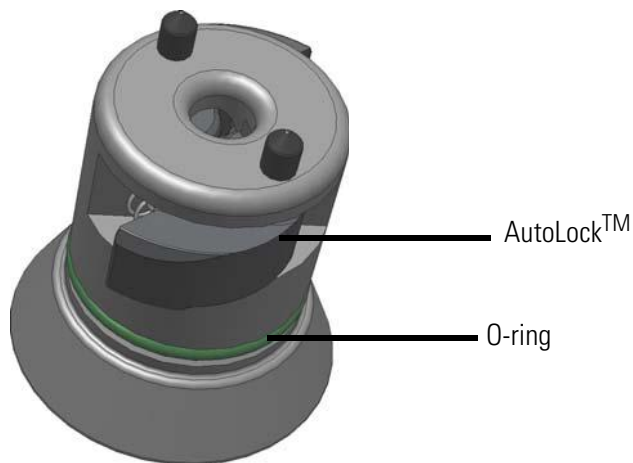


Figure 3-1. AutoLock™

2. Hold 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 small amount of pressure.

3. Check if the rotor is properly installed by lifting slightly on the handle. If the rotor can be pulled up, then it must be reclamped to the centrifuge spindle.



WARNING If the rotor cannot be properly locked in place after several attempts, then the AutoLock™ is defective and you are not permitted to operate the rotor. Check for any damage to the rotor, damaged rotors must not be used. Keep the hub area clear of objects.



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



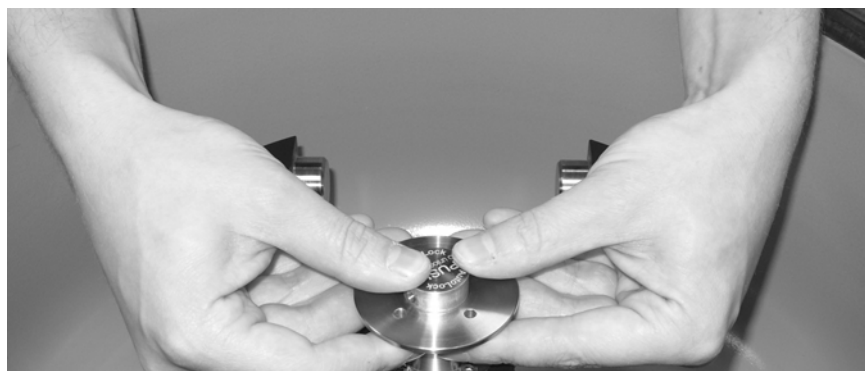
Be sure to check all seals before starting any aerosol-tight applications.

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 both hands and press against the green AutoLock™ button. At the same time, pull the rotor directly upwards with both hands and remove it from the centrifuge spindle. Make sure not to jam the rotor while doing this.



Rotor Loading

Contents

- “Before a Run” on page 4-2
- “Proper Loading” on page 4-2
- “Improper Loading” on page 4-3
- “Maximum Loading” on page 4-3
- “Cycle Counter” on page 4-4

Before a Run

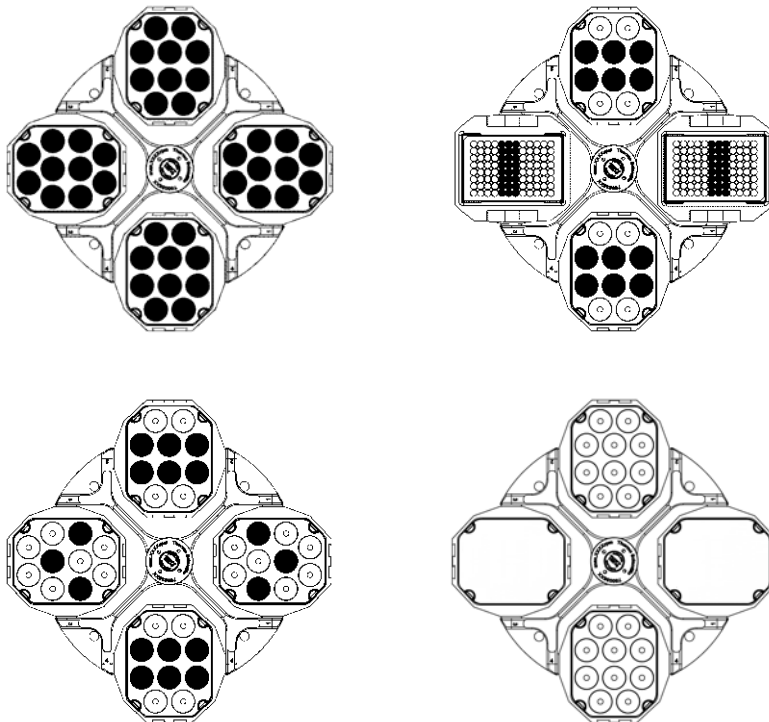
1. Please read and observe the safety instructions contained in these operating instructions and in the instructions for use.
2. Check the rotor and all accessory parts for damages such as cracks, scratches or traces of corrosion.
3. Check the rotor chamber, the motor shaft and the AutoLock™.
4. Check the rotor's suitability using the chemical compatibility chart on [page B-1](#).
5. Make sure the tubes or bottles do not touch the bucket lid.
6. Check the rotor bolts and apply grease 7500 3786 before using for the first time.
7. Check that each bucket or microplate carrier can swing freely by moving it carefully with your hand. Weigh the bucket content (adaptor and tube). Make sure you do not exceed the maximum compartment load.



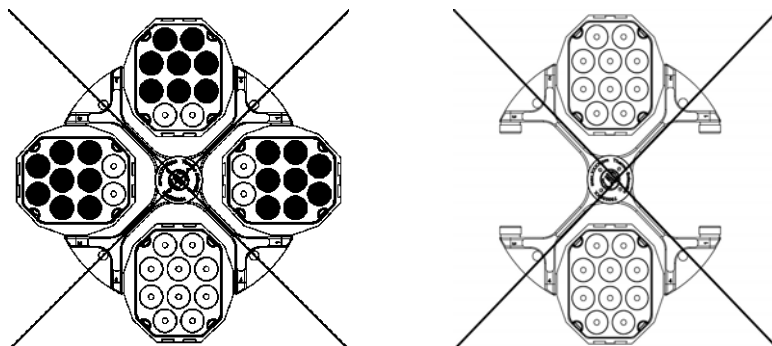
CAUTION Always use identical bucket types in a rotor. Always be sure to use buckets of the same weight class, which is marked on the buckets themselves.

Proper Loading

To ensure safe operation of the centrifuge, the rotor must be evenly loaded at all times.



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 adaptor, exceeds the maximum permissible load:

- Reduce the fill level.
- Reduce the speed.

Use the table or the formula:

| Actual Load (g/bucket) | RPM _{max} |
|------------------------|--------------------|
| 470 | 6300 |
| 490 | 6170 |
| 510 | 6048 |
| 530 | 5933 |
| 550 | 5824 |
| 570 | 5721 |
| 590 | 5623 |
| 610 | 5530 |
| 630 | 5442 |
| 650 | 5357 |
| 670 | 5277 |
| 690 | 5200 |
| 710 | 5126 |
| 730 | 5055 |

| Actual Load (g/bucket) | RPM _{max} |
|------------------------|--------------------|
| 750 | 4987 |
| 770 | 4922 |

$$n_{adm} = n_{max} \sqrt{\frac{\text{Maximum permissible load}}{\text{Effective load}}}$$

n_{adm} = admissible speed

n_{max} = maximum speed

Cycle Counter

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 is given in the rotor table in the rotor specification section.

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 service life at 30,000 cycles |
|--|---------------------------------------|
| frequent use 20 runs / day 220 days / year | 7 years |

Aerosol-tight Applications

Contents

- “Basic Principles” on page 5-2
- “Fill Level” on page 5-2
- “Checking the Aerosol-Tightness” on page 5-2

Basic Principles



CAUTION When centrifuging hazardous samples, do not open aerosol-tight rotors or buckets unless placed in a safety cabinet. Always bear in mind the maximum permitted fill levels.



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

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

Placing O-ring

The o-ring fulfills its purpose best, when it is neither stressed nor bulked. Meaning the o-ring should be equally placed in the groove of the lid.

Place the o-ring as follows:

1. Place the o-ring above the groove.
2. Push the o-ring on two opposite places into the groove. Make sure the rest of the o-ring is equally distributed.
3. Push the centers of the loose parts into the groove.
4. Push the remaining o-ring into place.

Note If the o-ring seems to be too long or too short, take it off the lid and repeat the process.

Fill Level

The 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 lids are open.

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-tight buckets using the following process:

1. Lubricate all seals lightly.
Always use the special grease 7600 3500 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 cover and the cover seal.



CAUTION Prior to each use, the seals in the bucket 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.

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

Damaged or clouded rotor covers are to be replaced immediately!



CAUTION This quick test is not suited for validating the aerosol tightness of your BIOShield™ 720. Check the seals and sealing surfaces of the lid thoroughly.

Maintenance and Care

Contents

- “Cleaning intervals” on page 6-2
- “Cleaning” on page 6-2
- “Disinfection” on page 6-3
- “Decontamination” on page 6-4
- “Autoclaving” on page 6-5
- “Service of Thermo Fisher Scientific” on page 6-6

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 or when polluted |
| Clean rotor | daily or when polluted |
| Accessories | daily or when polluted |
| 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

When cleaning centrifug

- 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 (7000 9824). 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 (7000 9824). 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 (7000 9824). Also treat the cavities with oil.
 - Treat the bolt of the swing out rotor with bolt 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.

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 (7000 9824). Also treat the cavities with oil.
 - Tread the bolt of the swing out rotor with bolt grease (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.

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.

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 technicians check 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.

RCF-Values

| Speed (rpm) | R _{min} | R _{max} | RCF R _{min} | RCF R _{max} |
|-------------|------------------|------------------|----------------------|----------------------|
| 300 | 6.7 | 16.2 | 7 | 16 |
| 400 | 6.7 | 16.2 | 12 | 29 |
| 500 | 6.7 | 16.2 | 19 | 45 |
| 600 | 6.7 | 16.2 | 27 | 65 |
| 700 | 6.7 | 16.2 | 37 | 89 |
| 800 | 6.7 | 16.2 | 48 | 116 |
| 900 | 6.7 | 16.2 | 61 | 147 |
| 1000 | 6.7 | 16.2 | 75 | 181 |
| 1100 | 6.7 | 16.2 | 91 | 219 |
| 1200 | 6.7 | 16.2 | 108 | 261 |
| 1300 | 6.7 | 16.2 | 127 | 306 |
| 1400 | 6.7 | 16.2 | 147 | 355 |
| 1500 | 6.7 | 16.2 | 169 | 408 |
| 1600 | 6.7 | 16.2 | 192 | 464 |
| 1700 | 6.7 | 16.2 | 216 | 523 |
| 1800 | 6.7 | 16.2 | 243 | 587 |
| 1900 | 6.7 | 16.2 | 270 | 654 |
| 2000 | 6.7 | 16.2 | 300 | 724 |
| 2100 | 6.7 | 16.2 | 330 | 799 |
| 2200 | 6.7 | 16.2 | 363 | 877 |
| 2300 | 6.7 | 16.2 | 396 | 958 |
| 2400 | 6.7 | 16.2 | 431 | 1043 |
| 2500 | 6.7 | 16.2 | 468 | 1132 |
| 2600 | 6.7 | 16.2 | 506 | 1224 |
| 2700 | 6.7 | 16.2 | 546 | 1320 |
| 2800 | 6.7 | 16.2 | 587 | 1420 |
| 2900 | 6.7 | 16.2 | 630 | 1523 |
| 3000 | 6.7 | 16.2 | 674 | 1630 |

A RCF-Values

| Speed (rpm) | R _{min} | R _{max} | RCF R _{min} | RCF R _{max} |
|-------------|------------------|------------------|----------------------|----------------------|
| 3100 | 6.7 | 16.2 | 720 | 1741 |
| 3200 | 6.7 | 16.2 | 767 | 1855 |
| 3300 | 6.7 | 16.2 | 816 | 1972 |
| 3400 | 6.7 | 16.2 | 866 | 2094 |
| 3500 | 6.7 | 16.2 | 918 | 2219 |
| 3600 | 6.7 | 16.2 | 971 | 2347 |
| 3700 | 6.7 | 16.2 | 1025 | 2479 |
| 3800 | 6.7 | 16.2 | 1082 | 2615 |
| 3900 | 6.7 | 16.2 | 1139 | 2755 |
| 4000 | 6.7 | 16.2 | 1198 | 2898 |
| 4100 | 6.7 | 16.2 | 1259 | 3045 |
| 4200 | 6.7 | 16.2 | 1321 | 3195 |
| 4300 | 6.7 | 16.2 | 1385 | 3349 |
| 4400 | 6.7 | 16.2 | 1450 | 3506 |
| 4500 | 6.7 | 16.2 | 1517 | 3668 |
| 4600 | 6.7 | 16.2 | 1585 | 3832 |
| 4700 | 6.7 | 16.2 | 1655 | 4001 |
| 4800 | 6.7 | 16.2 | 1726 | 4173 |
| 4900 | 6.7 | 16.2 | 1798 | 4349 |
| 5000 | 6.7 | 16.2 | 1873 | 4528 |
| 5100 | 6.7 | 16.2 | 1948 | 4711 |
| 5200 | 6.7 | 16.2 | 2025 | 4897 |
| 5300 | 6.7 | 16.2 | 2104 | 5088 |
| 5400 | 6.7 | 16.2 | 2184 | 5281 |
| 5500 | 6.7 | 16.2 | 2266 | 5479 |
| 5600 | 6.7 | 16.2 | 2349 | 5680 |
| 5700 | 6.7 | 16.2 | 2434 | 5884 |
| 5800 | 6.7 | 16.2 | 2520 | 6093 |
| 5900 | 6.7 | 16.2 | 2607 | 6305 |
| 6000 | 6.7 | 16.2 | 2697 | 6520 |
| 6100 | 6.7 | 16.2 | 2787 | 6739 |
| 6200 | 6.7 | 16.2 | 2879 | 6962 |
| 6300 | 6.7 | 16.2 | 2973 | 7188 |

Chemical Compatibility Chart

| CHEMICAL | MATERIAL | ALUMINUM | ANODIC COATING for ALUMINUM | BUNA N | CELLULOSE ACETATE BUTYRATE | POLYURETHANE ROTOR PAINT | COMPOSITE Carbon Fiber/Epoxy | DELIRIN® | ETHYLENE PROPYLENE | GLASS | NEOPRENE | NORYL® | NYLON | PET®, POLYCLEAR®, CLEARCRIMP®, CCLEARCRIMP® | POLYALLOMER | POLYCARBONATE | POLYESTER, GLASS THERMOSET | POLYETHERIMIDE | POLYETHYLENE | POLYPROPYLENE | POLYSULFONE | POLYVINYL CHLORIDE | RULONA®, 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 |

B 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 | NORLYL® | NYLON | PET®, POLYCLEAR®, CLEARCRIMP®, CCLEARCRIMP® | POLYALLUMER | POLYCARBONATE | POLYESTER, GLASS THERMOSET | POLYETHERIMIDE | POLYRTHYLENE | POLYPROPYLENE | POLYSULFONE | POLYVINYL CHLORIDE | RULON A®, TEFLON® | SILICONE RUBBER | STAINLESS STEEL | TITANIUM | TYGON® | VITON® |
| Cesium Acetate | M | - | S | - | S | S | S | - | S | S | S | S | - | S | S | - | - | S | S | S | S | S | S | M | S | S | S |
| Cesium Bromide | M | S | S | - | S | S | S | - | S | S | S | S | S | S | S | - | - | S | S | S | S | S | S | M | S | S | S |
| Cesium Chloride | M | S | S | U | S | S | S | - | S | S | S | S | S | S | S | - | - | S | S | S | S | S | S | M | S | S | S |
| Cesium Formate | M | S | S | - | S | S | S | - | S | S | S | S | S | S | S | - | - | S | S | S | S | S | S | M | S | S | S |
| Cesium Iodide | M | S | S | - | S | S | S | - | S | S | S | S | S | S | S | - | - | S | S | S | S | S | S | M | S | S | S |
| Cesium Sulfate | M | S | S | - | S | S | S | - | S | S | S | S | S | S | S | - | - | S | S | S | S | S | S | M | S | S | S |
| Chloroform | U | U | U | U | S | S | M | U | S | U | U | M | U | M | U | U | U | M | M | U | U | S | U | U | U | M | S |
| Chromic Acid (10%) | U | - | U | U | S | U | U | - | S | S | S | U | S | S | M | U | M | S | S | U | M | S | M | U | S | S | S |
| Chromic Acid (50%) | U | - | U | U | - | U | U | - | - | - | S | U | U | S | M | U | M | S | S | U | M | S | - | U | M | - | S |
| Cresol Mixture | S | S | U | - | - | - | S | - | S | U | U | U | U | U | U | - | - | U | U | - | U | S | S | S | S | U | S |
| Cyclohexane | S | S | S | - | S | S | S | U | S | U | S | S | U | U | U | M | S | M | U | M | M | S | U | M | M | U | S |
| Deoxycholate | S | S | S | - | S | S | S | - | S | S | S | S | S | S | S | - | - | S | S | S | S | S | S | S | S | S | S |
| Distilled Water | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Dextran | M | S | S | S | S | S | S | - | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | M | S | S | S |
| Diethyl Ether | S | S | U | U | S | S | S | U | S | U | U | S | U | U | U | U | U | U | U | U | U | U | S | S | S | M | U |
| Diethyl Ketone | S | - | U | U | - | - | M | - | S | U | - | S | - | M | U | U | U | M | M | - | U | S | - | - | S | U | U |
| Diethylpyrocarbonate | S | S | U | - | S | S | S | - | S | S | U | S | U | S | U | - | - | S | S | S | M | S | S | S | S | S | S |
| Dimethylsulfoxide | S | S | U | U | S | S | S | - | S | U | S | S | U | S | U | U | - | S | S | U | U | S | S | S | U | U | U |
| Dioxane | M | S | U | U | S | S | M | M | S | U | U | S | U | M | U | U | - | M | M | M | U | S | S | S | S | U | U |
| Ferric Chloride | U | U | S | - | - | - | M | S | - | M | - | S | - | S | - | - | - | S | S | - | - | - | M | U | S | - | S |
| Acetic Acid (Glacial) | S | S | U | U | S | S | U | M | S | U | S | U | U | U | U | U | M | S | U | M | U | S | U | U | S | - | U |
| Acetic Acid (5%) | S | S | M | S | S | S | M | S | S | S | S | S | M | S | S | S | S | S | S | S | M | S | S | M | S | S | M |
| Acetic Acid (60%) | S | S | U | U | S | S | U | - | S | M | S | U | U | M | U | S | M | S | M | S | M | S | M | U | S | M | U |
| Ethyl Acetate | M | M | U | U | S | S | M | M | S | S | U | S | U | M | U | U | - | S | S | U | U | S | M | M | S | U | U |
| Ethyl Alcohol (50%) | S | S | S | S | S | S | M | S | S | S | S | S | U | S | U | S | S | S | S | S | S | S | S | M | S | M | U |
| Ethyl Alcohol (95%) | S | S | S | U | S | S | M | S | S | S | S | S | U | S | U | - | S | S | S | M | S | S | S | U | S | M | U |
| Ethylene Dichloride | S | - | U | U | - | - | S | M | - | U | U | S | U | U | U | U | U | U | U | - | U | S | U | - | S | - | S |
| Ethylene Glycol | S | S | S | S | S | S | S | S | S | S | S | S | - | S | U | S | S | S | S | S | S | S | S | M | S | M | S |
| Ethylene Oxide Vapor | S | - | U | - | - | U | - | - | S | U | - | S | - | S | M | - | - | S | S | S | U | S | U | S | S | S | U |
| Ficoll-Hypaque® | M | S | S | - | S | S | S | - | S | S | S | S | - | S | S | - | S | S | S | S | S | S | S | M | S | S | S |

| CHEMICAL | MATERIAL | ALUMINUM | ANODIC COATING for ALUMINUM | BUNA N | CELLULOSE ACETATE BUTYRATE | POLYURETHANE ROTOR PAINT | COMPOSITE Carbon Fiber/Epoxy | DELTRIN® | ETHYLENE PROPYLENE | GLASS | NEOPRENE | NORYL® | NYLON | PET®, POLYCLEAR® ,CLEARCRIMP®,CCLEARCRIMP® | POLYALLUMER | POLYCARBONATE | POLYESTER, GLASS THERMOSET | POLYETHERIMIDE | POLYRTHYLENE | POLYPROPYLENE | POLYSULFONE | POLYVINYL CHLORIDE | RULON A®, TEFLON® | SILICONE RUBBER | STAINLESS STEEL | TITANIUM | TYGON® | VITON® |
|-----------------------------|-----------------|----------|-----------------------------|--------|----------------------------|--------------------------|------------------------------|----------|--------------------|-------|----------|--------|-------|--|-------------|---------------|----------------------------|----------------|--------------|---------------|-------------|--------------------|-------------------|-----------------|-----------------|----------|--------|--------|
| Hydrofluoric Acid (10%) | U | U | U | M | - | - | U | - | - | U | U | S | - | S | M | U | S | S | S | S | M | S | U | U | U | - | - | |
| Hydrofluoric Acid (50%) | U | U | U | U | - | - | U | - | - | U | U | U | U | S | U | U | U | S | S | M | M | S | U | U | U | - | M | |
| Hydrochloric Acid (conc.) | U | U | U | U | - | U | U | M | - | U | M | U | U | M | U | U | U | - | S | - | U | S | U | U | U | - | - | |
| Formaldehyde (40%) | M | M | M | S | S | S | S | M | S | S | S | S | M | S | S | S | U | S | S | M | S | S | S | M | S | M | U | |
| Glutaraldehyde | S | S | S | S | - | - | S | - | S | S | S | S | S | S | S | - | - | S | S | S | - | - | S | S | S | - | - | |
| Glycerol | M | S | S | - | S | S | S | S | S | S | S | S | S | S | S | S | - | S | S | S | S | S | S | S | S | S | S | 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 | 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 | U | M | U | U | U | S | M | U | S | U | |

B 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 | NORLYL® | NYLON | PET®, POLYCLEAR®, CLEARCRIMP®, CCLEARCRIMP® | POLYALLUMER | POLYCARBONATE | POLYESTER, GLASS THERMOSET | POLYETHERIMIDE | POLYRTHYLENE | POLYPROPYLENE | POLYSULFONE | POLYVINYL CHLORIDE | RULON A®, TEFLON® | SILICONE RUBBER | STAINLESS STEEL | TITANIUM | TYGON® | VITON® |
|----------------------------------|----------|----------|-----------------------------|--------|----------------------------|--------------------------|------------------------------|---------|--------------------|-------|----------|---------|-------|---|-------------|---------------|----------------------------|----------------|--------------|---------------|-------------|--------------------|-------------------|-----------------|-----------------|----------|--------|--------|
| 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 | S | M | S | S | S |
| Lactic Acid (100%) | - | - | S | - | - | - | - | - | - | M | S | U | - | S | S | S | M | S | S | - | M | S | M | S | S | - | S | |
| Lactic Acid (20%) | - | - | S | S | - | - | - | - | - | M | S | M | - | S | S | S | S | S | S | S | S | M | S | M | S | S | - | S |
| N-Butyl Alcohol | S | - | S | U | - | - | S | - | - | S | M | - | U | S | M | S | 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 | 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 | 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 | M | S | 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 | S |
| Picric Acid | S | S | U | - | S | M | S | S | S | M | S | U | S | S | S | U | S | S | S | S | S | U | S | U | M | S | M | S |

| CHEMICAL | MATERIAL | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------|----------|-----------------------------|--------|----------------------------|--------------------------|------------------------------|---------|--------------------|-------|----------|--------|-------|--|-------------|---------------|----------------------------|----------------|--------------|---------------|-------------|--------------------|-------------------|-----------------|-----------------|----------|--------|--------|
| | ALUMINUM | ANODIC COATING for ALUMINUM | BUNA N | CELLULOSE ACETATE BUTYRATE | POLYURETHANE ROTOR PAINT | COMPOSITE Carbon Fiber/Epoxy | DELRIN® | ETHYLENE PROPYLENE | GLASS | NEOPRENE | NORYL® | NYLON | PET®, POLYCLEAR® , CLEARCRIMP®, CCLEARCRIMP® | POLYALLUMER | POLYCARBONATE | POLYESTER, GLASS THERMOSET | POLYETHERIMIDE | POLYTRHYLENE | POLYPROPYLENE | POLYSULFONE | POLYVINYL CHLORIDE | RULON A®, TEFLON® | SILICONE RUBBER | STAINLESS STEEL | TITANIUM | TYGON® | VITON® |
| Pyridine (50%) | U | S | U | U | S | U | U | - | U | S | S | U | U | M | U | U | - | U | S | M | U | S | S | U | U | U | U |
| Rubidium Bromide | M | S | S | - | S | S | S | - | S | S | S | S | S | S | S | - | - | S | S | S | S | S | S | M | S | S | S |
| Rubidium Chloride | M | S | S | - | S | S | S | - | S | S | S | S | S | S | S | - | - | S | S | S | S | S | S | M | S | S | S |
| Sucrose | M | S | S | - | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Sucrose, Alkaline | M | S | S | - | S | S | S | - | S | S | S | S | S | S | U | S | S | S | S | S | S | S | S | M | S | S | S |
| Sulfosalicylic Acid | U | U | S | S | S | S | S | - | S | S | S | U | S | S | S | - | S | S | S | - | S | S | S | U | S | S | S |
| Nitric Acid (10%) | U | S | U | S | S | U | U | - | S | U | S | U | - | S | S | S | S | S | S | S | S | S | M | S | S | S | S |
| Nitric Acid (50%) | U | S | U | M | S | U | U | - | S | U | S | U | U | M | M | U | M | M | M | S | S | S | U | S | S | M | S |
| Nitric Acid (95%) | U | - | U | U | - | U | U | - | - | U | U | U | U | M | U | U | U | U | M | U | U | S | U | S | S | - | S |
| Hydrochloric Acid (10%) | U | U | M | S | S | S | U | - | S | S | S | U | U | S | U | S | S | S | S | S | S | S | S | U | M | S | S |
| Hydrochloric Acid (50%) | U | U | U | U | S | U | U | - | S | M | S | U | U | M | U | U | S | S | S | S | M | S | M | U | U | M | M |
| Sulfuric Acid (10%) | M | U | U | S | S | U | U | - | S | S | M | U | S | S | S | S | S | S | S | S | S | S | U | U | U | S | S |
| Sulfuric Acid (50%) | M | U | U | U | S | U | U | - | S | S | M | U | U | S | U | U | M | S | S | S | S | S | U | U | U | M | S |
| Sulfuric Acid (conc.) | M | U | U | U | - | U | U | M | - | - | M | U | U | S | U | U | U | M | S | U | M | S | U | U | U | - | S |
| Stearic Acid | S | - | S | - | - | - | S | M | S | S | S | S | - | S | S | S | S | S | S | S | S | S | M | M | S | S | S |
| Tetrahydrofuran | S | S | U | U | S | U | U | M | S | U | U | S | U | U | U | - | M | U | U | U | U | S | U | S | S | U | U |
| Toluene | S | S | U | U | S | S | M | U | S | U | U | S | U | U | U | S | U | M | U | U | U | S | U | S | U | U | M |
| Trichloroacetic Acid | U | U | U | - | S | S | U | M | S | U | S | U | U | S | M | - | M | S | S | U | U | S | U | U | U | M | U |
| Trichloroethane | S | - | U | - | - | - | M | U | - | U | - | S | U | U | U | U | U | U | U | U | U | S | U | - | S | - | S |
| Trichloroethylene | - | - | U | U | - | - | - | U | - | U | - | S | U | U | U | U | U | U | U | U | U | S | U | - | U | - | S |
| Trisodium Phosphate | - | - | - | S | - | - | M | - | - | - | - | - | - | S | - | - | S | S | S | - | - | S | - | - | S | - | S |
| Tris Buffer (neutral pH) | U | S | S | S | S | S | S | - | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Triton X-100® | S | S | S | - | S | S | S | - | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Urea | S | - | U | S | S | S | S | - | - | - | - | S | S | S | M | S | S | S | S | - | S | S | S | M | S | - | S |
| Hydrogen Peroxide (10%) | U | U | M | S | S | U | U | - | S | S | S | U | S | S | S | M | U | S | S | S | S | S | S | M | S | U | S |
| Hydrogen Peroxide (3%) | S | M | S | S | S | - | S | - | S | S | S | S | S | S | S | S | M | S | S | S | S | S | S | S | S | S | S |
| Xylene | S | S | U | S | S | S | M | U | S | U | U | U | U | U | U | M | U | M | U | U | U | S | U | M | S | U | S |
| Zinc Chloride | U | U | S | S | S | U | S | 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 |

B Chemical Compatibility Chart

*Polyethyleneterephthalate

Key

S Satisfactory

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

U Unsatisfactory, not recommended.

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

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

Contact Information

| | |
|---------------|-----------------|
| United States | 866-9-THERMO |
| | +1 866 984 3766 |

| | |
|--------|-----------------|
| Canada | +1 866 984 3766 |
|--------|-----------------|

| | |
|---------|---------------|
| Austria | +43 1 801 400 |
|---------|---------------|

| | |
|---------|-----------------|
| Belgium | +32 2 482 30 30 |
|---------|-----------------|

| | |
|---------|------------------|
| Germany | 08001 536 376 |
| | +49 6184 90 6940 |

| | |
|--------|-----------------|
| France | +33 2 2803 2180 |
| | +33 2 2803 2000 |

| | |
|-------|---------------------|
| Italy | +39 02 02 95059 341 |
|-------|---------------------|

| | |
|-------------|-----------------|
| Netherlands | +31 76 571 4440 |
|-------------|-----------------|

| | |
|---------------------------|----------------|
| Nordic / Baltic Countries | +35 89 329 100 |
|---------------------------|----------------|

| | |
|--------|--------------------|
| Russia | +7 (812) 703 42 15 |
|--------|--------------------|

Contact Information

Spain +34 932 23 09 18

Portugal +34 932 23 09 18

Switzerland +41 44 454 12 12

UK / Ireland +44 870 609 9203

China +86 21 6865 4588

+86 10 8419 3588

India +91 22 6716 2200

Japan +81 45 453 9220

Other Asian Countries +852 2885 4613

Latin America +1 866 984 3766

Other Countries +49 6184 90 6940

+33 2 2803 2180

Index

| | |
|--------------------------------------|-----|
| A | |
| Accessories | 2-1 |
| Aerosol-tight Applications | 5-1 |
| Autoclaving | 6-5 |
| B | |
| Basic Principles | 5-2 |
| Before a Run | 4-2 |
| C | |
| Care | 6-1 |
| Checking the Aerosol-Tightness | 5-2 |
| Chemical Compatibility Chart | B-1 |
| Cleaning | 6-2 |
| Cleaning Agents | 6-3 |
| Contact Information | C-1 |
| Cycle Counter | 4-4 |
| D | |
| Decontamination | 6-4 |
| Disinfection | 6-3 |
| F | |
| Fill Level | 5-2 |
| H | |
| Heraeus | 1-2 |
| I | |
| Improper Loading | 4-3 |
| M | |
| Maintenance | 6-1 |
| Maximum Loading | 4-3 |
| P | |
| Placing O-ring | 5-2 |
| Precautions | iii |
| Preface | iii |
| Proper Loading | 4-2 |
| Q | |
| Quick Test | 5-3 |
| R | |
| RCF-Values | A-1 |
| Removing the Rotor | 3-3 |
| Rotor Installation | 3-2 |
| Rotor Loading | 4-1 |
| Rotor Specifications | 1-1 |
| S | |
| Scope of Supply | iii |
| Service Technician | 6-6 |
| Sorvall | 1-4 |
| T | |
| Thermo Scientific | 1-7 |

