



Thermo Fisher Scientific

# FIBER*Lite*<sup>™</sup> F21-48x2

## Instruction Manual

50120023-3

October 2009

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## 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                    |
|----------------|---------------------|----------|--------------------------|
| 75003664       | FIBERLite™ F21-48x2 | 1        | <input type="checkbox"/> |
| 76003500       | Rubber seal grease  | 1        | <input type="checkbox"/> |
| 70009824       | Anti-corrosion oil  | 1        | <input type="checkbox"/> |
| 50120023       | 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 FIBERLite™ F21-48x2, 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 that have been loaded properly.
- Never overload the rotor.

## 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:  $1,2 \frac{g}{ml}$



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 1-6
- “Thermo Scientific” on page 1-12

# Heraeus

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

| Centrifuge  | Heraeus Multifuge X3 | Heraeus Multifuge X3F | Heraeus Multifuge X1 |
|---|----------------------|-----------------------|----------------------|
| Catalog #   | 75004500             | 75004530              | 75004210             |
| Weight empty [kg] of rotor  | 1.75                 | 1.75                  | 1.75                 |
| Maximum permissible load [g]  | 48x3.2               | 48x3.2                | 48x3.2               |
| maximum speed $n_{max}$ [rpm]   | 15200                | 15200                 | 15200                |
| maximum RCF value at $n_{max}$  | 25055                | 25055                 | 25055                |
| max. / min. radius [cm]   | 9.7 / 6.4            | 9.7 / 6.4             | 9.7 / 6.4            |
| Pitch angle [°]   | 45                   | 45                    | 45                   |
| Accel. / braking time [s]   | 40 / 40              | 40 / 40               | 45 / 45              |
| sample heating at $n_{max}$ [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 20                   | 20                    | 21                   |
| aerosol-tight   | no                   | no                    | no                   |
| max temperature for autoclaving °C  | 121                  | 121                   | 121                  |

| Centrifuge  | Heraeus Megafuge 40 |
|---|---------------------|
| Catalog #   | 75004503            |
| Weight empty [kg] of rotor  | 1.75                |
| Maximum permissible load [g]  | 48x3.2              |
| maximum speed $n_{max}$ [rpm]   | 15200               |
| maximum RCF value at $n_{max}$  | 25055               |
| max. / min. radius [cm]   | 9.7 / 6.4           |
| Pitch angle [°]   | 45                  |
| Accel. / braking time [s]   | 40 / 40             |
| sample heating at $n_{max}$ [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 20                  |
| aerosol-tight   | no                  |
| max temperature for autoclaving °C  | 121                 |



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

| <b>Centrifuge</b>                  | <b>Heraeus Multifuge X3R</b> | <b>Heraeus Multifuge X3FR</b> | <b>Heraeus Multifuge X1R</b> |
|------------------------------------|------------------------------|-------------------------------|------------------------------|
| Catalog #                          | 75004515                     | 75004536                      | 75004250                     |
| Weight empty [kg] of rotor         | 1.75                         | 1.75                          | 1.75                         |
| Maximum permissible load [g]       | 48x3.2                       | 48x3.2                        | 48x3.2                       |
| maximum speed $n_{max}$ [rpm]      | 15200                        | 15200                         | 15200                        |
| maximum RCF value at $n_{max}$     | 25055                        | 25055                         | 25055                        |
| max. / min. radius [cm]            | 9.7 / 6.4                    | 9.7 / 6.4                     | 9.7 / 6.4                    |
| Pitch angle [°]                    | 45                           | 45                            | 45                           |
| Accel. / braking time [s]          | 35 / 40                      | 35 / 40                       | 45 / 45                      |
| aerosol-tight                      | no                           | no                            | no                           |
| max temperature for autoclaving °C | 121                          | 121                           | 121                          |

| <b>Centrifuge</b>                  | <b>Heraeus Megafuge 40R</b> |
|------------------------------------|-----------------------------|
| Catalog #                          | 75004518                    |
| Weight empty [kg] of rotor         | 1.75                        |
| Maximum permissible load [g]       | 48x3.2                      |
| maximum speed $n_{max}$ [rpm]      | 15200                       |
| maximum RCF value at $n_{max}$     | 25055                       |
| max. / min. radius [cm]            | 9.7 / 6.4                   |
| Pitch angle [°]                    | 45                          |
| Accel. / braking time [s]          | 35 / 40                     |
| aerosol-tight                      | no                          |
| max temperature for autoclaving °C | 121                         |

## 1 Rotor Specifications

Heraeus

**Table 1-3.** 120V 60Hz ventilated

| Centrifuge   | Heraeus Multifuge X3 | Heraeus Multifuge X3F | Heraeus Multifuge X1 |
|--|----------------------|-----------------------|----------------------|
| Catalog #  | 75004501             | 75004531              | 75004211             |
| Weight empty [kg] of rotor   | 1.75                 | 1.75                  | 1.75                 |
| Maximum permissible load [g]   | 48x3.2               | 48x3.2                | 48x3.2               |
| maximum speed $n_{\max}$ [rpm]   | 15200                | 15200                 | 15200                |
| maximum RCF value at $n_{\max}$  | 25055                | 25055                 | 25055                |
| max. / min. radius [cm]  | 9.7 / 6.4            | 9.7 / 6.4             | 9.7 / 6.4            |
| Pitch angle [°]  | 45                   | 45                    | 45                   |
| Accel. / braking time [s]  | 40 / 40              | 40 / 40               | 45 / 45              |
| sample heating at $n_{\max}$ [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 20                   | 20                    | 22                   |
| aerosol-tight  | no                   | no                    | no                   |
| max temperature for autoclaving °C   | 121                  | 121                   | 121                  |

| Centrifuge   | Heraeus Megafuge 40 |
|--|---------------------|
| Catalog #  | 75004504            |
| Weight empty [kg] of rotor   | 1.75                |
| Maximum permissible load [g]   | 48x3.2              |
| maximum speed $n_{\max}$ [rpm]   | 15200               |
| maximum RCF value at $n_{\max}$  | 25055               |
| max. / min. radius [cm]  | 9.7 / 6.4           |
| Pitch angle [°]  | 45                  |
| Accel. / braking time [s]  | 40 / 40             |
| sample heating at $n_{\max}$ [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 20                  |
| aerosol-tight  | no                  |
| max temperature for autoclaving °C   | 121                 |

**Table 1-4.** 120V 60Hz refrigerated

| <b>Centrifuge</b>                  | <b>Heraeus Multifuge X3R</b> | <b>Heraeus Multifuge X3FR</b> | <b>Heraeus Multifuge X1R</b> |
|------------------------------------|------------------------------|-------------------------------|------------------------------|
| Catalog #                          | 75004516                     | 75004537                      | 75004251                     |
| Weight empty [kg] of rotor         | 1.75                         | 1.75                          | 1.75                         |
| Maximum permissible load [g]       | 48x3.2                       | 48x3.2                        | 48x3.2                       |
| maximum speed $n_{\max}$ [rpm]     | 15200                        | 15200                         | 15200                        |
| maximum RCF value at $n_{\max}$    | 25055                        | 25055                         | 25055                        |
| max. / min. radius [cm]            | 9.7 / 6.4                    | 9.7 / 6.4                     | 9.7 / 6.4                    |
| Pitch angle [°]                    | 45                           | 45                            | 45                           |
| Accel. / braking time [s]          | 35 /40                       | 35 /40                        | 45 / 45                      |
| aerosol-tight                      | no                           | no                            | no                           |
| max temperature for autoclaving °C | 121                          | 121                           | 121                          |

| <b>Centrifuge</b>                  | <b>Heraeus Megafuge 40R</b> |
|------------------------------------|-----------------------------|
| Catalog #                          | 75004519                    |
| Weight empty [kg] of rotor         | 1.75                        |
| Maximum permissible load [g]       | 48x3.2                      |
| maximum speed $n_{\max}$ [rpm]     | 15200                       |
| maximum RCF value at $n_{\max}$    | 25055                       |
| max. / min. radius [cm]            | 9.7 / 6.4                   |
| Pitch angle [°]                    | 45                          |
| Accel. / braking time [s]          | 35 /40                      |
| aerosol-tight                      | no                          |
| max temperature for autoclaving °C | 121                         |

# Sorvall

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

| Centrifuge  | Sorvall Legend XT | Sorvall Legend XF | Sorvall Legend X1 |
|---|-------------------|-------------------|-------------------|
| Catalog #   | 75004505          | 75004532          | 75004220          |
| Weight empty [kg] of rotor  | 1.75              | 1.75              | 1.75              |
| Maximum permissible load [g]  | 48x3.2            | 48x3.2            | 48x3.2            |
| maximum speed $n_{max}$ [rpm]   | 15200             | 15200             | 15200             |
| maximum RCF value at $n_{max}$  | 25055             | 25055             | 25055             |
| max. / min. radius [cm]   | 9.7 / 6.4         | 9.7 / 6.4         | 9.7 / 6.4         |
| Pitch angle [°]   | 45                | 45                | 45                |
| Accel. / braking time [s]   | 40 / 40           | 40 / 40           | 45 / 45           |
| sample heating at $n_{max}$ [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 20                | 20                | 21                |
| aerosol-tight   | no                | no                | no                |
| max temperature for autoclaving °C  | 121               | 121               | 121               |

| Centrifuge  | Sorvall ST 40 |
|---|---------------|
| Catalog #   | 75004509      |
| Weight empty [kg] of rotor  | 1.75          |
| Maximum permissible load [g]  | 48x3.2        |
| maximum speed $n_{max}$ [rpm]   | 15200         |
| maximum RCF value at $n_{max}$  | 25055         |
| max. / min. radius [cm]   | 9.7 / 6.4     |
| Pitch angle [°]   | 45            |
| Accel. / braking time [s]   | 40 / 40       |
| sample heating at $n_{max}$ [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 20            |
| aerosol-tight   | no            |
| max temperature for autoclaving °C  | 121           |

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

| <b>Centrifuge</b>                  | <b>Sorvall Legend XTR</b> | <b>Sorvall Legend XFR</b> | <b>Sorvall Legend X1R</b> |
|------------------------------------|---------------------------|---------------------------|---------------------------|
| Catalog #                          | 75004520                  | 75004538                  | 75004260                  |
| Weight empty [kg] of rotor         | 1.75                      | 1.75                      | 1.75                      |
| Maximum permissible load [g]       | 48x3.2                    | 48x3.2                    | 48x3.2                    |
| maximum speed $n_{max}$ [rpm]      | 15200                     | 15200                     | 15200                     |
| maximum RCF value at $n_{max}$     | 25055                     | 25055                     | 25055                     |
| max. / min. radius [cm]            | 9.7 / 6.4                 | 9.7 / 6.4                 | 9.7 / 6.4                 |
| Pitch angle [°]                    | 45                        | 45                        | 45                        |
| Accel. / braking time [s]          | 34 / 40                   | 34 / 40                   | 45 / 45                   |
| aerosol-tight                      | no                        | no                        | no                        |
| max temperature for autoclaving °C | 121                       | 121                       | 121                       |

| <b>Centrifuge</b>                  | <b>Sorvall ST 40R</b> |
|------------------------------------|-----------------------|
| Catalog #                          | 75004524              |
| Weight empty [kg] of rotor         | 1.75                  |
| Maximum permissible load [g]       | 48x3.2                |
| maximum speed $n_{max}$ [rpm]      | 15200                 |
| maximum RCF value at $n_{max}$     | 25055                 |
| max. / min. radius [cm]            | 9.7 / 6.4             |
| Pitch angle [°]                    | 45                    |
| Accel. / braking time [s]          | 34 / 40               |
| aerosol-tight                      | no                    |
| max temperature for autoclaving °C | 121                   |

## 1 Rotor Specifications

Sorvall

**Table 1-7.** 120V 60Hz ventilated

| Centrifuge   | Sorvall Legend XT | Sorvall Legend XF | Sorvall Legend X1 |
|--|-------------------|-------------------|-------------------|
| Catalog #  | 75004506          | 75004533          | 75004221          |
| Weight empty [kg] of rotor   | 1.75              | 1.75              | 1.75              |
| Maximum permissible load [g]   | 48x3.2            | 48x3.2            | 48x3.2            |
| maximum speed $n_{\max}$ [rpm]   | 15200             | 15200             | 15200             |
| maximum RCF value at $n_{\max}$  | 25055             | 25055             | 25055             |
| max. / min. radius [cm]  | 9.7 / 6.4         | 9.7 / 6.4         | 9.7 / 6.4         |
| Pitch angle [°]  | 45                | 45                | 45                |
| Accel. / braking time [s]  | 40 /40            | 40 /40            | 45 / 45           |
| sample heating at $n_{\max}$ [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 20                | 20                | 22                |
| aerosol-tight  | no                | no                | no                |
| max temperature for autoclaving °C   | 121               | 121               | 121               |

| Centrifuge   | Sorvall ST 40 |
|--|---------------|
| Catalog #  | 75004510      |
| Weight empty [kg] of rotor   | 1.75          |
| Maximum permissible load [g]   | 48x3.2        |
| maximum speed $n_{\max}$ [rpm]   | 15200         |
| maximum RCF value at $n_{\max}$  | 25055         |
| max. / min. radius [cm]  | 9.7 / 6.4     |
| Pitch angle [°]  | 45            |
| Accel. / braking time [s]  | 40 /40        |
| sample heating at $n_{\max}$ [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 20            |
| aerosol-tight  | no            |
| max temperature for autoclaving °C   | 121           |

**Table 1-8.** 120V 60Hz refrigerated

| <b>Centrifuge</b>                  | <b>Sorvall Legend XTR</b> | <b>Sorvall Legend XFR</b> | <b>Sorvall Legend X1R</b> |
|------------------------------------|---------------------------|---------------------------|---------------------------|
| Catalog #                          | 75004521                  | 75004539                  | 75004261                  |
| Weight empty [kg] of rotor         | 1.75                      | 1.75                      | 1.75                      |
| Maximum permissible load [g]       | 48x3.2                    | 48x3.2                    | 48x3.2                    |
| maximum speed $n_{max}$ [rpm]      | 15200                     | 15200                     | 15200                     |
| maximum RCF value at $n_{max}$     | 25055                     | 25055                     | 25055                     |
| max. / min. radius [cm]            | 9.7 / 6.4                 | 9.7 / 6.4                 | 9.7 / 6.4                 |
| Pitch angle [°]                    | 45                        | 45                        | 45                        |
| Accel. / braking time [s]          | 35 / 30                   | 35 / 30                   | 45 / 45                   |
| aerosol-tight                      | no                        | no                        | no                        |
| max temperature for autoclaving °C | 121                       | 121                       | 121                       |

| <b>Centrifuge</b>                  | <b>Sorvall ST 40R</b> | <b>Sorvall ST 16R</b> |
|------------------------------------|-----------------------|-----------------------|
| Catalog #                          | 75004525              | 75004281              |
| Weight empty [kg] of rotor         | 1.75                  | 1.75                  |
| Maximum permissible load [g]       | 48x3.2                | 48x3.2                |
| maximum speed $n_{max}$ [rpm]      | 15200                 | 15200                 |
| maximum RCF value at $n_{max}$     | 25055                 | 25055                 |
| max. / min. radius [cm]            | 9.7 / 6.4             | 9.7 / 6.4             |
| Pitch angle [°]                    | 45                    | 45                    |
| Accel. / braking time [s]          | 35 / 30               | 55 / 50               |
| aerosol-tight                      | no                    | no                    |
| max temperature for autoclaving °C | 121                   | 121                   |

## 1 Rotor Specifications

Sorvall

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

| Centrifuge  | Sorvall Legend XT | Sorvall Legend XF | Sorvall Legend X1 |
|---|-------------------|-------------------|-------------------|
| Catalog #   | 75004507          | 75004534          | 75004223          |
| Weight empty [kg] of rotor  | 1.75              | 1.75              | 1.75              |
| Maximum permissible load [g]  | 48x3.2            | 48x3.2            | 48x3.2            |
| maximum speed $n_{max}$ [rpm]   | 15200             | 15200             | 15200             |
| maximum RCF value at $n_{max}$  | 25055             | 25055             | 25055             |
| max. / min. radius [cm]   | 9.7 / 6.4         | 9.7 / 6.4         | 9.7 / 6.4         |
| Pitch angle [°]   | 45                | 45                | 45                |
| Accel. / braking time [s]   | 40 / 40           | 40 / 40           | 45 / 45           |
| sample heating at $n_{max}$ [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 20                | 20                | 22                |
| aerosol-tight   | no                | no                | no                |
| max temperature for autoclaving °C  | 121               | 121               | 121               |

| Centrifuge  | Sorvall ST 40 |
|---|---------------|
| Catalog #   | 75004511      |
| Weight empty [kg] of rotor  | 1.75          |
| Maximum permissible load [g]  | 48x3.2        |
| maximum speed $n_{max}$ [rpm]   | 15200         |
| maximum RCF value at $n_{max}$  | 25055         |
| max. / min. radius [cm]   | 9.7 / 6.4     |
| Pitch angle [°]   | 45            |
| Accel. / braking time [s]   | 40 / 40       |
| sample heating at $n_{max}$ [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 20            |
| aerosol-tight   | no            |
| max temperature for autoclaving °C  | 121           |



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

| <b>Centrifuge</b>                  | <b>Sorvall Legend XTR</b> | <b>Sorvall Legend XFR</b> | <b>Sorvall Legend X1R</b> |
|------------------------------------|---------------------------|---------------------------|---------------------------|
| Catalog #                          | 75004522                  | 75004540                  | 75004263                  |
| Weight empty [kg] of rotor         | 1.75                      | 1.75                      | 1.75                      |
| Maximum permissible load [g]       | 48x3.2                    | 48x3.2                    | 48x3.2                    |
| maximum speed $n_{max}$ [rpm]      | 15200                     | 15200                     | 15200                     |
| maximum RCF value at $n_{max}$     | 25055                     | 25055                     | 25055                     |
| max. / min. radius [cm]            | 9.7 / 6.4                 | 9.7 / 6.4                 | 9.7 / 6.4                 |
| Pitch angle [°]                    | 45                        | 45                        | 45                        |
| Accel. / braking time [s]          | 35 / 40                   | 35 / 40                   | 45 / 45                   |
| aerosol-tight                      | no                        | no                        | no                        |
| max temperature for autoclaving °C | 121                       | 121                       | 121                       |

| <b>Centrifuge</b>                  | <b>Sorvall ST 40R</b> |
|------------------------------------|-----------------------|
| Catalog #                          | 75004526              |
| Weight empty [kg] of rotor         | 1.75                  |
| Maximum permissible load [g]       | 48x3.2                |
| maximum speed $n_{max}$ [rpm]      | 15200                 |
| maximum RCF value at $n_{max}$     | 25055                 |
| max. / min. radius [cm]            | 9.7 / 6.4             |
| Pitch angle [°]                    | 45                    |
| Accel. / braking time [s]          | 35 / 40               |
| aerosol-tight                      | no                    |
| max temperature for autoclaving °C | 121                   |

# Thermo Scientific

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

| Centrifuge  | Thermo Scientific SL 40 | Thermo Scientific SL 40 F |
|---|-------------------------|---------------------------|
| Catalog #   | 75004512                | 75004542                  |
| Weight empty [kg] of rotor  | 1.75                    | 1.75                      |
| Maximum permissible load [g]  | 48x3.2                  | 48x3.2                    |
| maximum speed $n_{max}$ [rpm]   | 15200                   | 15200                     |
| maximum RCF value at $n_{max}$  | 25055                   | 25055                     |
| max. / min. radius [cm]   | 9.7 / 6.4               | 9.7 / 6.4                 |
| Pitch angle [°]   | 45                      | 45                        |
| Accel. / braking time [s]   | 40 / 40                 | 40 / 40                   |
| sample heating at $n_{max}$ [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 20                      | 20                        |
| aerosol-tight   | no                      | no                        |
| max temperature for autoclaving °C  | 121                     | 121                       |

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

| Centrifuge                         | Thermo Scientific SL 40R | Thermo Scientific SL 40 FR |
|------------------------------------|--------------------------|----------------------------|
| Catalog #                          | 75004527                 | 75004543                   |
| Weight empty [kg] of rotor         | 1.75                     | 1.75                       |
| Maximum permissible load [g]       | 48x3.2                   | 48x3.2                     |
| maximum speed $n_{max}$ [rpm]      | 15200                    | 15200                      |
| maximum RCF value at $n_{max}$     | 25055                    | 25055                      |
| max. / min. radius [cm]            | 9.7 / 6.4                | 9.7 / 6.4                  |
| Pitch angle [°]                    | 45                       | 45                         |
| Accel. / braking time [s]          | 35 / 40                  | 35 / 40                    |
| aerosol-tight                      | no                       | no                         |
| max temperature for autoclaving °C | 121                      | 121                        |

**Table 1-13.** 120V 60Hz ventilated

| <b>Centrifuge</b>   | <b>Thermo Scientific SL 40</b> |
|---|--------------------------------|
| Catalog #   | 75004513                       |
| Weight empty [kg] of rotor  | 1.75                           |
| Maximum permissible load [g]  | 48x3.2                         |
| maximum speed $n_{max}$ [rpm]   | 15200                          |
| maximum RCF value at $n_{max}$  | 25055                          |
| max. / min. radius [cm]   | 9.7 / 6.4                      |
| Pitch angle [°]   | 45                             |
| Accel. / braking time [s]   | 40 / 40                        |
| sample heating at $n_{max}$ [° C] referred to ambient temperature of 23 °C, running time 60 minutes | 20                             |
| aerosol-tight   | no                             |
| max temperature for autoclaving °C  | 121                            |

**Table 1-14.** 120V 60Hz refrigerated

| <b>Centrifuge</b>                  | <b>Thermo Scientific SL 40R</b> |
|------------------------------------|---------------------------------|
| Catalog #                          | 75004528                        |
| Weight empty [kg] of rotor         | 1.75                            |
| Maximum permissible load [g]       | 48x3.2                          |
| maximum speed $n_{max}$ [rpm]      | 15200                           |
| maximum RCF value at $n_{max}$     | 25055                           |
| max. / min. radius [cm]            | 9.7 / 6.4                       |
| Pitch angle [°]                    | 45                              |
| Accel. / braking time [s]          | 35 / 40                         |
| aerosol-tight                      | no                              |
| max temperature for autoclaving °C | 121                             |

# Accessories

## Contents

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

Thermo Scientific General Purpose Rotors

F21-48x2 Carbon Fiber Rotor

## F21-48x2 Fixed Angle Carbon Fiber Rotor

### Rotor Specifications

|                      |         |
|----------------------|---------|
| Capacity (ml)        | 48 x 2  |
| Tube Dimensions (mm) | 11 x 50 |
| Angle °              | 45      |
| Maximum Speed (rpm)  | 15,200  |
| K Factor             | 455     |
| Net Weight (kg)      | 2,6     |

| RCF/Radius | RCF (x g) | Radius (cm) |
|------------|-----------|-------------|
| Maximum    | 25,055    | 9,7         |
| Minimum    | 16,516    | 6,4         |



### F21-48x2 Carbon Fiber Rotor Package

| Cat. No. | Description                       |
|----------|-----------------------------------|
| 75003664 | F21-48x1.5/2ml Carbon Fiber Rotor |

### Accessories

| Cat. No.   | Description              |
|------------|--------------------------|
| 099-489021 | Replacement Lid Assembly |
| 021-489021 | O-ring Refresher Kit     |

### 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         |   |
| -        | 2              | -              | Microtube          | -    | -                | 11x45         | -                          | -        | -           | -                  | -        | -                     | - |
| -        | 1,5            | -              | Microtube          | -    | -                | 11x45         | -                          | -        | -           | -                  | -        | -                     | - |
| -        | 1,5            | -              | Millipore Ultra-MC | -    | -                | 11 x 50       | -                          | -        | -           | -                  | -        | -                     | - |
| -        | 0,6            | -              | Microtube          | -    | -                | 7x32          | -                          | -        | -           | 76003758           | 12       | 1                     | - |
| -        | 0,4            | -              | Microtube          | -    | -                | 7x29          | -                          | -        | -           | 76003759           | 12       | 1                     | - |
| -        | 0,2            | -              | PCR Reaction Tube  | -    | -                | 6x24          | -                          | -        | -           | 76003750           | 12       | 1                     | - |

# AutoLock™

## Contents

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

## Rotor Installation



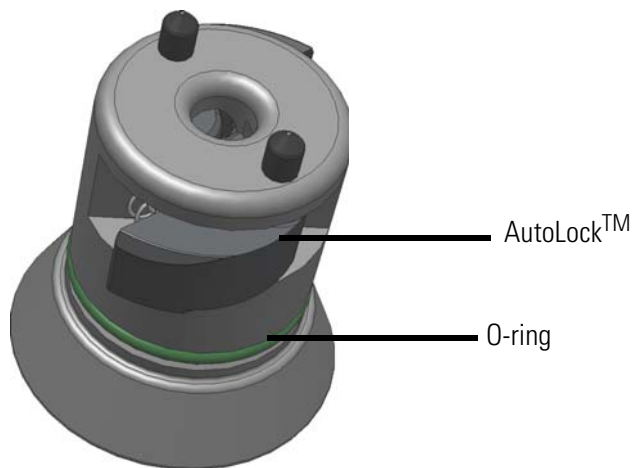
**CAUTION** Unapproved or incorrectly combined accessories can cause serious damage to the centrifuge.

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 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

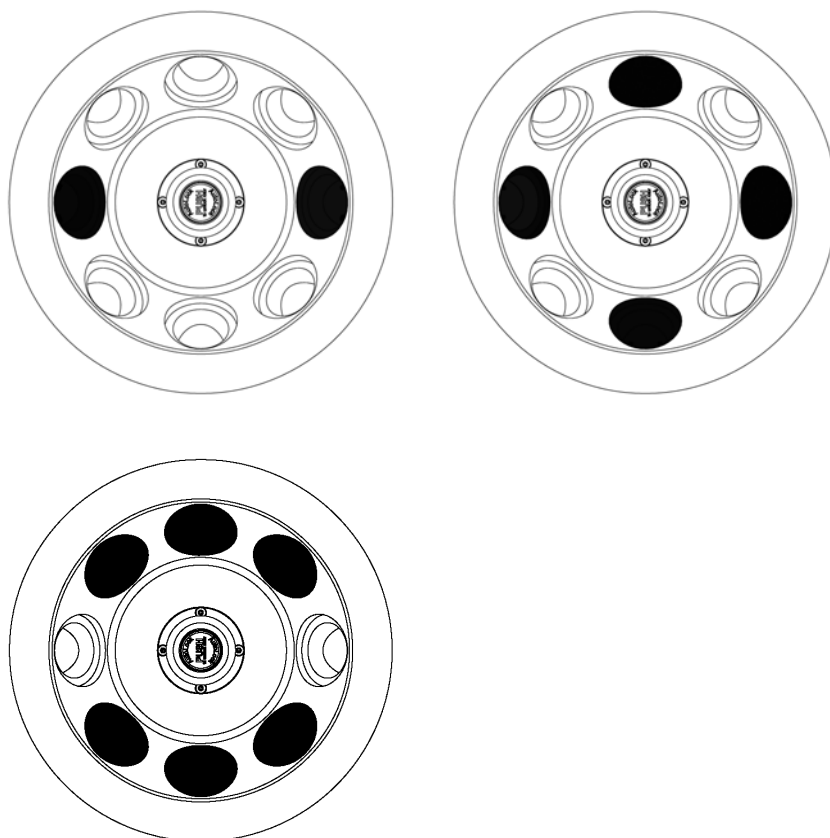
- “Before Run” on page 4-2
- “Proper Loading” on page 4-2
- “Improper Loading” on page 4-3
- “Maximum Loading” on page 4-3

## Before Run

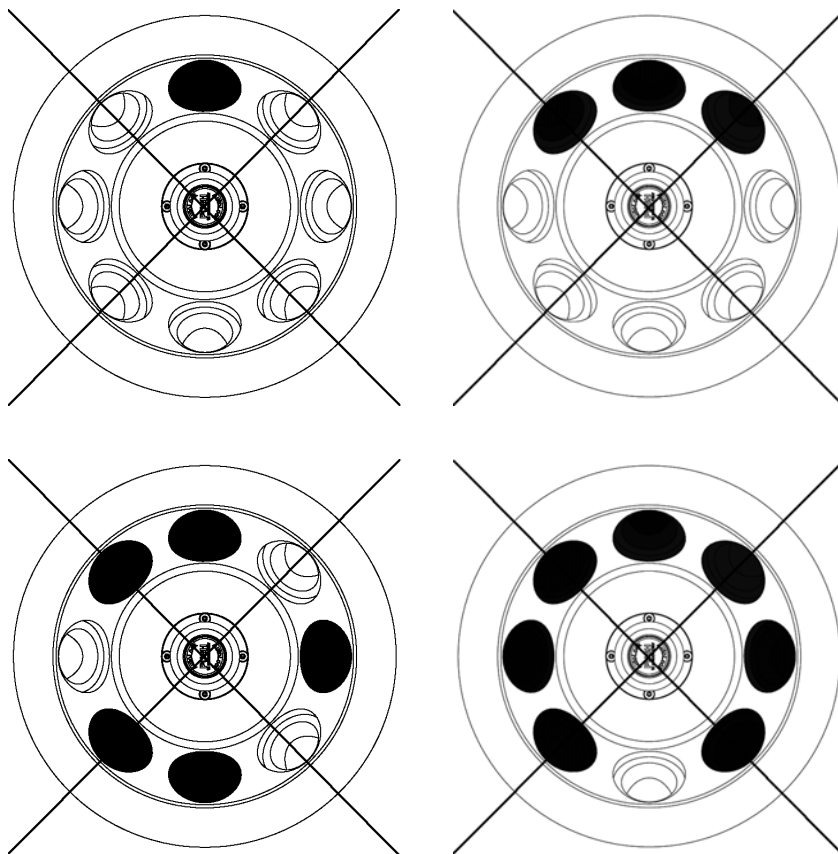
1. Please read and observe the safety instructions contained in these operating instructions and in the instructions for use.
2. Check the rotor and all accessory parts for damages such as cracks, scratches or traces of corrosion.
3. Check the rotor chamber, the centrifuge spindle and the AutoLock™.
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 lid.

## 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 symmetrically balance the tubes in the rotor. This refers to each cavity.

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 this formular:

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

$n_{adm}$  = admissible speed

$n_{max}$  = maximum speed

# 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.

## 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-tightness of fixed-angle rotors using the following process:

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

# 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 6-5

## 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.
  - Treat 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 needed.

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 rotor with 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.
  - Treat the bottom of the swing out rotor with bold 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 <sub>min</sub> | R <sub>max</sub> | RCF R <sub>min</sub> | RCF R <sub>max</sub> |
|-------------|------------------|------------------|----------------------|----------------------|
| 300         | 6.3              | 9.7              | 6                    | 10                   |
| 400         | 6.3              | 9.7              | 11                   | 17                   |
| 500         | 6.3              | 9.7              | 18                   | 27                   |
| 600         | 6.3              | 9.7              | 25                   | 39                   |
| 700         | 6.3              | 9.7              | 35                   | 53                   |
| 800         | 6.3              | 9.7              | 45                   | 69                   |
| 900         | 6.3              | 9.7              | 57                   | 88                   |
| 1000        | 6.3              | 9.7              | 70                   | 108                  |
| 1100        | 6.3              | 9.7              | 85                   | 131                  |
| 1200        | 6.3              | 9.7              | 101                  | 156                  |
| 1300        | 6.3              | 9.7              | 119                  | 183                  |
| 1400        | 6.3              | 9.7              | 138                  | 213                  |
| 1500        | 6.3              | 9.7              | 158                  | 244                  |
| 1600        | 6.3              | 9.7              | 180                  | 278                  |
| 1700        | 6.3              | 9.7              | 204                  | 313                  |
| 1800        | 6.3              | 9.7              | 228                  | 351                  |
| 1900        | 6.3              | 9.7              | 254                  | 391                  |
| 2000        | 6.3              | 9.7              | 282                  | 434                  |
| 2100        | 6.3              | 9.7              | 311                  | 478                  |
| 2200        | 6.3              | 9.7              | 341                  | 525                  |
| 2300        | 6.3              | 9.7              | 373                  | 574                  |
| 2400        | 6.3              | 9.7              | 406                  | 625                  |
| 2500        | 6.3              | 9.7              | 440                  | 678                  |
| 2600        | 6.3              | 9.7              | 476                  | 733                  |
| 2700        | 6.3              | 9.7              | 513                  | 791                  |
| 2800        | 6.3              | 9.7              | 552                  | 850                  |
| 2900        | 6.3              | 9.7              | 592                  | 912                  |
| 3000        | 6.3              | 9.7              | 634                  | 976                  |

| Speed (rpm) | R <sub>min</sub> | R <sub>max</sub> | RCF R <sub>min</sub> | RCF R <sub>max</sub> |
|-------------|------------------|------------------|----------------------|----------------------|
| 3100        | 6.3              | 9.7              | 677                  | 1042                 |
| 3200        | 6.3              | 9.7              | 721                  | 1110                 |
| 3300        | 6.3              | 9.7              | 767                  | 1181                 |
| 3400        | 6.3              | 9.7              | 814                  | 1254                 |
| 3500        | 6.3              | 9.7              | 863                  | 1328                 |
| 3600        | 6.3              | 9.7              | 913                  | 1405                 |
| 3700        | 6.3              | 9.7              | 964                  | 1485                 |
| 3800        | 6.3              | 9.7              | 1017                 | 1566                 |
| 3900        | 6.3              | 9.7              | 1071                 | 1649                 |
| 4000        | 6.3              | 9.7              | 1127                 | 1735                 |
| 4100        | 6.3              | 9.7              | 1184                 | 1823                 |
| 4200        | 6.3              | 9.7              | 1242                 | 1913                 |
| 4300        | 6.3              | 9.7              | 1302                 | 2005                 |
| 4400        | 6.3              | 9.7              | 1364                 | 2100                 |
| 4500        | 6.3              | 9.7              | 1426                 | 2196                 |
| 4600        | 6.3              | 9.7              | 1490                 | 2295                 |
| 4700        | 6.3              | 9.7              | 1556                 | 2396                 |
| 4800        | 6.3              | 9.7              | 1623                 | 2499                 |
| 4900        | 6.3              | 9.7              | 1691                 | 2604                 |
| 5000        | 6.3              | 9.7              | 1761                 | 2711                 |
| 5100        | 6.3              | 9.7              | 1832                 | 2821                 |
| 5200        | 6.3              | 9.7              | 1905                 | 2932                 |
| 5300        | 6.3              | 9.7              | 1978                 | 3046                 |
| 5400        | 6.3              | 9.7              | 2054                 | 3162                 |
| 5500        | 6.3              | 9.7              | 2131                 | 3280                 |
| 5600        | 6.3              | 9.7              | 2209                 | 3401                 |
| 5700        | 6.3              | 9.7              | 2288                 | 3523                 |
| 5800        | 6.3              | 9.7              | 2369                 | 3648                 |
| 5900        | 6.3              | 9.7              | 2452                 | 3775                 |
| 6000        | 6.3              | 9.7              | 2536                 | 3904                 |
| 6100        | 6.3              | 9.7              | 2621                 | 4035                 |
| 6200        | 6.3              | 9.7              | 2707                 | 4169                 |
| 6300        | 6.3              | 9.7              | 2796                 | 4304                 |
| 6400        | 6.3              | 9.7              | 2885                 | 4442                 |
| 6500        | 6.3              | 9.7              | 2976                 | 4582                 |
| 6600        | 6.3              | 9.7              | 3068                 | 4724                 |
| 6700        | 6.3              | 9.7              | 3162                 | 4868                 |

| Speed (rpm) | R <sub>min</sub> | R <sub>max</sub> | RCF R <sub>min</sub> | RCF R <sub>max</sub> |
|-------------|------------------|------------------|----------------------|----------------------|
| 6800        | 6.3              | 9.7              | 3257                 | 5015                 |
| 6900        | 6.3              | 9.7              | 3353                 | 5163                 |
| 7000        | 6.3              | 9.7              | 3451                 | 5314                 |
| 7100        | 6.3              | 9.7              | 3551                 | 5467                 |
| 7200        | 6.3              | 9.7              | 3651                 | 5622                 |
| 7300        | 6.3              | 9.7              | 3753                 | 5779                 |
| 7400        | 6.3              | 9.7              | 3857                 | 5939                 |
| 7500        | 6.3              | 9.7              | 3962                 | 6100                 |
| 7600        | 6.3              | 9.7              | 4068                 | 6264                 |
| 7700        | 6.3              | 9.7              | 4176                 | 6430                 |
| 7800        | 6.3              | 9.7              | 4285                 | 6598                 |
| 7900        | 6.3              | 9.7              | 4396                 | 6768                 |
| 8000        | 6.3              | 9.7              | 4508                 | 6941                 |
| 8100        | 6.3              | 9.7              | 4621                 | 7115                 |
| 8200        | 6.3              | 9.7              | 4736                 | 7292                 |
| 8300        | 6.3              | 9.7              | 4852                 | 7471                 |
| 8400        | 6.3              | 9.7              | 4970                 | 7652                 |
| 8500        | 6.3              | 9.7              | 5089                 | 7835                 |
| 8600        | 6.3              | 9.7              | 5209                 | 8021                 |
| 8700        | 6.3              | 9.7              | 5331                 | 8208                 |
| 8800        | 6.3              | 9.7              | 5454                 | 8398                 |
| 8900        | 6.3              | 9.7              | 5579                 | 8590                 |
| 9000        | 6.3              | 9.7              | 5705                 | 8784                 |
| 9100        | 6.3              | 9.7              | 5833                 | 8980                 |
| 9200        | 6.3              | 9.7              | 5962                 | 9179                 |
| 9300        | 6.3              | 9.7              | 6092                 | 9379                 |
| 9400        | 6.3              | 9.7              | 6224                 | 9582                 |
| 9500        | 6.3              | 9.7              | 6357                 | 9787                 |
| 9600        | 6.3              | 9.7              | 6491                 | 9994                 |
| 9700        | 6.3              | 9.7              | 6627                 | 10204                |
| 9800        | 6.3              | 9.7              | 6764                 | 10415                |
| 9900        | 6.3              | 9.7              | 6903                 | 10629                |
| 10000       | 6.3              | 9.7              | 7043                 | 10845                |
| 10100       | 6.3              | 9.7              | 7185                 | 11063                |
| 10200       | 6.3              | 9.7              | 7328                 | 11283                |
| 10300       | 6.3              | 9.7              | 7472                 | 11505                |
| 10400       | 6.3              | 9.7              | 7618                 | 11730                |

| Speed (rpm) | R <sub>min</sub> | R <sub>max</sub> | RCF R <sub>min</sub> | RCF R <sub>max</sub> |
|-------------|------------------|------------------|----------------------|----------------------|
| 10500       | 6.3              | 9.7              | 7765                 | 11956                |
| 10600       | 6.3              | 9.7              | 7914                 | 12185                |
| 10700       | 6.3              | 9.7              | 8064                 | 12416                |
| 10800       | 6.3              | 9.7              | 8215                 | 12649                |
| 10900       | 6.3              | 9.7              | 8368                 | 12884                |
| 11000       | 6.3              | 9.7              | 8523                 | 13122                |
| 11100       | 6.3              | 9.7              | 8678                 | 13362                |
| 11200       | 6.3              | 9.7              | 8835                 | 13603                |
| 11300       | 6.3              | 9.7              | 8994                 | 13847                |
| 11400       | 6.3              | 9.7              | 9154                 | 14094                |
| 11500       | 6.3              | 9.7              | 9315                 | 14342                |
| 11600       | 6.3              | 9.7              | 9478                 | 14592                |
| 11700       | 6.3              | 9.7              | 9642                 | 14845                |
| 11800       | 6.3              | 9.7              | 9807                 | 15100                |
| 11900       | 6.3              | 9.7              | 9974                 | 15357                |
| 12000       | 6.3              | 9.7              | 10142                | 15616                |
| 12100       | 6.3              | 9.7              | 10312                | 15878                |
| 12200       | 6.3              | 9.7              | 10483                | 16141                |
| 12300       | 6.3              | 9.7              | 10656                | 16407                |
| 12400       | 6.3              | 9.7              | 10830                | 16675                |
| 12500       | 6.3              | 9.7              | 11005                | 16945                |
| 12600       | 6.3              | 9.7              | 11182                | 17217                |
| 12700       | 6.3              | 9.7              | 11360                | 17491                |
| 12800       | 6.3              | 9.7              | 11540                | 17768                |
| 12900       | 6.3              | 9.7              | 11721                | 18046                |
| 13000       | 6.3              | 9.7              | 11903                | 18327                |
| 13100       | 6.3              | 9.7              | 12087                | 18610                |
| 13200       | 6.3              | 9.7              | 12272                | 18896                |
| 13300       | 6.3              | 9.7              | 12459                | 19183                |
| 13400       | 6.3              | 9.7              | 12647                | 19473                |
| 13500       | 6.3              | 9.7              | 12837                | 19764                |
| 13600       | 6.3              | 9.7              | 13027                | 20058                |
| 13700       | 6.3              | 9.7              | 13220                | 20354                |
| 13800       | 6.3              | 9.7              | 13413                | 20652                |
| 13900       | 6.3              | 9.7              | 13609                | 20953                |
| 14000       | 6.3              | 9.7              | 13805                | 21255                |
| 14100       | 6.3              | 9.7              | 14003                | 21560                |

| Speed (rpm) | R <sub>min</sub> | R <sub>max</sub> | RCF R <sub>min</sub> | RCF R <sub>max</sub> |
|-------------|------------------|------------------|----------------------|----------------------|
| 14200       | 6.3              | 9.7              | 14202                | 21867                |
| 14300       | 6.3              | 9.7              | 14403                | 22176                |
| 14400       | 6.3              | 9.7              | 14605                | 22487                |
| 14500       | 6.3              | 9.7              | 14809                | 22801                |
| 14600       | 6.3              | 9.7              | 15014                | 23116                |
| 14700       | 6.3              | 9.7              | 15220                | 23434                |
| 14800       | 6.3              | 9.7              | 15428                | 23754                |
| 14900       | 6.3              | 9.7              | 15637                | 24076                |
| 15000       | 6.3              | 9.7              | 15848                | 24400                |
| 15100       | 6.3              | 9.7              | 16060                | 24727                |
| 15200       | 6.3              | 9.7              | 16273                | 25055                |



# Chemical Compatibility Chart

| CHEMICAL                   | 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®, CCLLEARCRIMP® | POLYALLOMER | POLYCARBONATE | POLYESTER, GLASS THERMOSET | POLYETHERIMIDE | POLYETHYLENE | 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             | 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      |

## 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 | NORYL® | NYLON | PET®, POLYGLAR®, CLEARCRIMP®, CCCLEARCRIMP® | POLYALLOMER | POLYCARBONATE | POLYESTER, GLASS THERMOSET | POLYETHERIMIDE | POLYRTHYLENE | POLYPROPYLENE | POLYSULFONE | POLYVINYL CHLORIDE | RULON A®, TEFLON® | SILICONE RUBBER | STAINLESS STEEL | TITANIUM | TYGON® | VITON® |
| 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      |
| 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      |

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

## 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 | NORYL® | NYLON | PET®, POLYGLAR®, CLEARCRIMP®, CCCLEARCRIMP® | POLYALLOMER | POLYCARBONATE | POLYESTER, GLASS THERMOSET | POLYETHERIMIDE | POLYRTHYLENE | POLYPROPYLENE | POLYSULFONE | POLYVINYL CHLORIDE | RULON A®, TEFLON® | SILICONE RUBBER | STAINLESS STEEL | TITANIUM | TYGON® | VITON® |
|--------------------------|----------|----------|-----------------------------|--------|----------------------------|--------------------------|------------------------------|---------|--------------------|-------|----------|--------|-------|---|-------------|---------------|----------------------------|----------------|--------------|---------------|-------------|--------------------|-------------------|-----------------|-----------------|----------|--------|--------|
| Methyl Alcohol           | S        | S        | S                           | U      | S                          | S                        | M                            | S       | 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               | S        | U      | U      |
| Metrizamide®             | M        | S        | S                           | -      | S                          | S                        | S                            | -       | S                  | S     | S        | S      | -     | S   | S           | -             | -                          | S              | S            | S             | S           | S                  | S                 | M               | S               | S        | S      |        |
| Lactic Acid (100%)       | -        | -        | S                           | -      | -                          | -                        | -                            | -       | -                  | M     | S        | U      | -     | S   | S           | S             | M                          | S              | S            | -             | M           | S                  | M                 | S               | S               | -        | S      |        |
| Lactic Acid (20%)        | -        | -        | S                           | S      | -                          | -                        | -                            | -       | -                  | M     | S        | M      | -     | S   | S           | S             | S                          | S              | S            | S             | 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                  | 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      |        |

| CHEMICAL                         | MATERIAL | ALUMINUM | ANODIC COATING for ALUMINUM | BUNA N | CELLULOSE ACETATE BUTYRATE | POLYURETHANE ROTOR PAINT | COMPOSITE Carbon Fiber/Epoxy | DELRIN® | ETHYLENE PROPYLENE | GLASS | NEOPRENE | NORYL® | NYLON | PET®, POLYCLEAR®, CLEARCRIMP®, CCCLEARCRIMP® | POLYALLUMER | POLYCARBONATE | POLYESTER, GLASS THERMOSET | POLYETHERIMIDE | POLYRTHYLENE | POLYPROPYLENE | POLYSULFONE | POLYVINYL CHLORIDE | RULON A®, TEFLON® | SILICONE RUBBER | STAINLESS STEEL | TITANIUM | TYGON® | VITON® |
|----------------------------------|----------|----------|-----------------------------|--------|----------------------------|--------------------------|------------------------------|---------|--------------------|-------|----------|--------|-------|--|-------------|---------------|----------------------------|----------------|--------------|---------------|-------------|--------------------|-------------------|-----------------|-----------------|----------|--------|--------|
| 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      |
| 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      | 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      | 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      | 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      | 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      | 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      | 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      | S      |
| Nitric Acid (50%)                | U        | S        | U                           | M      | S                          | U                        | U                            | -       | S                  | U     | S        | U      | M     | M  | U           | M             | M                          | M              | S            | S             | S           | S                  | U                 | S               | S               | M        | S      | 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        | 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      | 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      | 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      | 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      | 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      | 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      | 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      | 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      | 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      | U      |
| Trichloroethane                  | S        | -        | U                           | -      | -                          | -                        | M                            | U       | -                  | U     | -        | S      | U     | U  | U           | U             | U                          | U              | U            | U             | U           | S                  | U                 | -               | S               | -        | S      | S      |
| Trichloroethylene                | -        | -        | U                           | U      | -                          | -                        | -                            | U       | -                  | U     | -        | S      | U     | U  | U           | U             | U                          | U              | U            | U             | U           | S                  | U                 | -               | U               | -        | S      | S      |
| Trisodium Phosphate              | -        | -        | -                           | S      | -                          | -                        | M                            | -       | -                  | -     | -        | -      | -     | S  | -           | -             | 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      | 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      | S      |
| Urea                             | S        | -        | U                           | S      | S                          | S                        | S                            | -       | -                  | -     | -        | S      | S     | S  | M           | S             | S                          | S              | S            | -             | S           | S                  | S                 | M               | S               | -        | 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      | 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      | 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      | 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      | 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 | NORYL® | NYLON | PET®, POLYGLLEAR®, CLEARCRIMP®, CCCLEARCRIMP® | POLYALLOMER | POLYCARBONATE | POLYESTER, GLASS THERMOSET | POLYETHERIMIDE | POLYRTHYLENE | POLYPROPYLENE | POLYSULFONE | POLYVINYL CHLORIDE | RULON A®, TEFLON® | SILICONE RUBBER | STAINLESS STEEL | TITANIUM | TYGON® | VITON® |
|---------------------------|----------|----------|-----------------------------|--------|----------------------------|--------------------------|------------------------------|---------|--------------------|-------|----------|--------|-------|---|-------------|---------------|----------------------------|----------------|--------------|---------------|-------------|--------------------|-------------------|-----------------|-----------------|----------|--------|--------|
| Zinc Sulfate              |          | U        | S                           | S      | -                          | S                        | S                            | S       | S                  | S     | S        | S      | S     | S   | S           | S             | S                          | S              | S            | S             | S           | S                  | S                 | S               | S               | S        | S      | S      |
| Citric Acid (10%)         |          | M        | S                           | S      | M                          | S                        | S                            | M       | S                  | S     | S        | S      | S     | S   | S           | S             | S                          | M              | S            | S             | S           | S                  | S                 | S               | S               | S        | S      | S      |
| Polyethyleneterephthalate |          |          |                             |        |                            |                          |                              |         |                    |       |          |        |       |   |             |               |                            |                |              |               |             |                    |                   |                 |                 |          |        |        |

### Key

S Satisfactory

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

U Unsatisfactory, not recommended.

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

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

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