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# Thermo Scientific CW3 Cell Washer

## Instruction Manual

50144259_h • 06 / 2018

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# KONFORMITÄTSERKLÄRUNG
# DECLARATION OF CONFORMITY

CE

Name und Anschrift des Herstellers und des Bevollmächtigten
für die Zusammenstellung der relevanten technischen Unterlagen:
*Name and address of the manufacturer and of the authorized representative to compile the relevant technical documentation:*

**Thermo Electron LED GmbH**
**Zweigniederlassung Osterode**
**Am Kalkberg**
**37520 Osterode am Harz**
**Germany**

Gegenstand der Erklärung / *Object of the declaration*:

| | |
|---|---|
| **Beschreibung /description** | **: Zentrifuge mit Zubehör / Centrifuge with accessories** |
| **Marke / brand** | **: Thermo Scientific** |
| **Modellbezeichnung / model name** | **: CW3** |
| **Modell Nr. / model no.** | **: 75007405** |
| **Gültig ab Equipmentnr.**<br>**Valid from equipment no.** | **: O63458** |

mit allen einschlägigen Bestimmungen der Richtlinie über In-vitro-Diagnostika 98/79/EG in Übereinstimmung ist.
*is in conformity with all relevant terms of directive for in vitro diagnostic medical devices 98/79/EC.*

Die Maschine ist auch in Übereinstimmung mit den Schutzzielen der Maschinenrichtlinie 2006/42/EG, der Niederspannungsrichtlinie 2014/35/EU und der Richtlinie 2014/30/EU über elektromagnetische Verträglichkeit.
*The machinery is in accordance with the protection goals for the directives machinery 2006/42/EC, low voltage 2014/35/EU and electromagnetic compatibility 2014/30/EC.*

Der oben beschriebene Gegenstand der Erklärung erfüllt auch die Vorschriften der Richtlinie 2011/65/EU des Europäischen Parlaments und des Rates vom 8. Juni 2011 zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten. Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller.
*The object of the declaration described above is also in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.*
*This declaration of conformity is issued under the sole responsibility of the manufacturer.*

Angewandte Normen/
Standards used:

**EN 61010-1: 2004**
**EN 61010-2-020: 2006**
**EN 61010-2-101: 2002**
**EN 61326-1: 2013**
**EN 61326-2-6: 2013**

Unterzeichnet für und im Namen von: Thermo Electron LED GmbH.
*Signed for and on behalf of: Thermo Electron LED GmbH*

Osterode am Harz, den 26.10.2016

Dr. Andreas Karl,
Director R&D Global Project Management

| | Name | Datum | Dokument | Revision |
|---|---|---|---|---|
| | | | 50148108 | 01 |
| Freigegeben | **Abdullah Laaboubi** | 18.10.2016 | | |

# Table of Contents

# 1. Preface

## 1. 1. Items Supplied

| Article No. | Description | Quantity | |
|---|---|---|---|
| | Thermo Scientific CW3 cell washer | 1 | |
| S402776A | Bowl Assembly | 1 |  |
| S413259C | Tank (5 L) | 1 |  |
| 4744346 | Tubing | 3 m |  |
| 75000015 | Tube Connector | 1 |  |
| S4011034 | Drain Tube | 2.5 m |  |
| 480270 | Test Tubes (12 mm in diameter and 75 mm in length) | 50 (1 box) |  |
| 483719 | Grease | 1 |  |
| 8046004 | Hex. Wrench | 1 |  |
| S411107 | Motor Guard Plate | 1 |  |
| <br>4666354<br>4666357<br>4666355 | Hose Band<br>Small<br>Medium<br>Big | <br>1<br>1<br>2 |  |
| S413181A | L-shaped Adapter | 1 |  |
| 480879 | D10 Adapter | 25 |  |
| | Power Cord | 1 | |
| | Instruction Manual | 1 |  |

| **Rotor Assembly Options** | | **1** | |
|---|---|---|---|
| 75000020 | 24 place rotor assembly with distributor | | |
| 75000021 | 12 place rotor assembly with distributor | | |

| Article No. | Description | Quantity | |
|---|---|---|---|
| **Replacement Parts** | | | |
| | Rotor Assembly | 1 | |
| 75000022 | 24 places | |  |
| 75000023 | 12 places | |  |
| | Distributor Assembly | 1 | |
| 75000024 | 24 places | |  |
| 75000025 | 12 places | |  |

# 1. 2. Intended Use

The Thermo Scientific CW3 cell washer is designed to perform cell washing in multiple washing cycles using saline solution. The cell washer provides blood cells after sample separation, which can be used for further blood testing such as Antiglobulin test, ABO compatibility, Rh testing, Cross-matching and Antibody screening.

The centrifuge should always be operated by a trained individual such as a clinical laboratory technologist or a person with a similar education.

# 1. 3. Precautions

Carefully read the following safety precautions for a thorough understanding.

Protection is impaired if the cell washer is not used as specified in the intended use.

Follow the instructions and procedures described in this instruction manual to operate this cell washer safely.

Be sure to observe the precautions in this instruction manual and on your equipment.

It is the general obligation of the operator to make sure, that the proper protective clothing is used. Mind the „Laboratory Biosafety Manual“ of the World Health Organization (WHO) and the regulations in your country.

Safety messages are indicated as follows. They are stated with signal words combined with the safety alert symbol to call your attention to items or operations that could be dangerous to you or other persons using this equipment. The definitions of signal words are as follows:

- **WARNING**: Warning notes indicate any condition or practice, which if not strictly observed, could result in serious injury or possible death.
- **CAUTION**: Caution notes indicate any condition or practice, which if not strictly observed or stopped, could result in personal injury, damage or destruction of the equipment.
- **NOTICE**: Notes indicate an area or subject of special merit, emphasizing either the product's capabilities or common errors in operation or maintenance.

Do not operate this cell washer in any manner not described in this Instruction Manual. Should you have any troubles with this cell washer, call a Thermo Fisher Scientific authorized sales/service representative.

The precautions described in this Instruction Manual are carefully developed to cover all possible risks. It is important that you are alert for unexpected incidents. Be careful when operating this cell washer.

## ⚠ WARNING

1. The cell washer is neither inert nor protected against explosion. Never use the cell washer in an explosion-prone environment.
2. Do not set up the cell washer in or near places where flammable gases are generated or chemicals are stored.
3. If centrifuging any hazardous materials mind the „Laboratory Biosafety Manual“ of the World Health Organization (WHO). Look on the internet page of the World Health Organization (www.who.int) for the „Laboratory Biosafety Manual“.

   For materials in a higher risk group, extra safety measures have to be taken.
4. Take all necessary safety measures before using samples that are toxic or radioactive, or blood samples that are pathogenic or infectious. You use such samples at your own responsibility.
   a. If the cell washer, rotor, or an accessory is contaminated by samples that are toxic or radioactive, or blood samples that are pathogenic or infectious, be sure to decontaminate the item according to good laboratory procedures and methods.
   b. If there is a possibility that the cell washer, rotor, or an accessory is contaminated by samples that might impair human health (for example, samples that are toxic or radioactive, or blood samples that are pathogenic or infectious), it is your responsibility to sterilize or decontaminate the cell washer, rotor, or the accessory properly before requesting repairs from a Thermo Fisher Scientific authorized sales/service representative.
   c. It is your responsibility to sterilize and/or decontaminate the cell washer, rotor, or parts properly before returning them to a Thermo Fisher Scientific authorized sales/service representative.
5. Do not centrifuge explosive or flammable materials or substances which could react violently
6. Because the liquid samples, the saline, etc. are used in this cell washer, your cell washer must be grounded properly.
7. To avoid electrical shocks, do not handle the power cord or turn on or off the POWER switch with wet hands.
8. The cell washer itself may move if the rotor fails during high-speed rotation. Make sure there is a 30 cm area around the cell washer that will allow for such movement and do not allow individuals to enter into that area during operation. Also do not place dangerous objects such as flammable or explosive materials on top of the cell washer or in the surrounding area.
9. While the rotor spins, never unlock the door.
10. Repairs, disassembly, and other modifications to the cell washer are strictly prohibited unless performed by a Thermo Fisher Scientific authorized sales/service representative.

## ⚠ CAUTION

1. Turn off the cell washer at the main switch. The mains plug must be freely accessible at all times.
   Press STOP to shut the cell washer down.
   Pull out the power supply plug or disconnect the power supply in an emergency.
2. Use the cell washer only with correct installed rotor and distributor assembly and correct inserted bowl, splash guard and drain cover.
3. Do not move or relocate the cell washer while the rotor spins.
4. Do not lean on the cell washer.
5. Do not pour any solution such as water, detergent, or disinfectant directly into the rotor chamber. If you do so, the bearings of the drive unit might corrode or deteriorate.
6. Connect the saline tank to the pump inlet connector of the cell washer correctly with the hose bands (standard accessories). Otherwise the liquid might leak from the tube and the liquid might get into the inside of the cell washer. If you think liquid is inside of the cell washer, contact a Thermo Fisher Scientific authorized sales/service representative to clean and dry the cell washer.
7. Before you operate the cell washer, remove any dropped objects and tube fragments from inside the rotor chamber.
8. Always check for corrosion and damage on the rotor before using it. Do not use a corroded or damaged rotor.
9. Be sure to use the specified test tubes with a wall thickness of 1 mm or more. When using thin test tubes such as disposable test tubes, do not use them repeatedly. If any scratches, crack, inside warp, etc. is found on the test tubes, do not use them because they cannot bear a centrifugal force.
10. Be sure to load test tubes to all the holders.
11. Use one or two drops (about 50 µl) of 3-5% erythrocyte suspension as sample volume for blood cell washing. When using precipitated erythrocyte layer, use one or two drops (about 50 µl or less) per test tube. Use the 80% or less of the test tube capacity as sample volume for centrifugation.
12. If you observe some abnormality in this product, stop using it immediately and contact a Thermo Fisher Scientific authorized sales/service representative. Notify the service representative of the alarm code if displayed.
13. If the cell washer will not be used for a long time, remove the power cord from the socket.
14. For connection to a different outlet, the power cord might be needed to be replaced.
15. Follow local electrical codes.
16. Depending on the magnitude, an earthquake might damage the cell washer.
    If you observe some abnormality, contact a Thermo Fisher Scientific authorized sales/service representative.

## NOTICE

Usually the control panel and the surface of the cell washer get warm during operation.

# 1. 4. Symbols Used on the Cell Washer

This symbol refers to general hazards.

CAUTION means that material damage could occur.

WARNING means that injuries or material damage or contamination could occur.

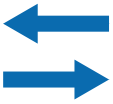
This symbol refers to biological hazards.

Observe the information contained in the instruction manual to keep yourself and your environment safe.

This symbol refers to information on hazards, described within the manual.

This symbol demands to disconnect mains before transporting or servicing the cell washer.

This symbol demands to not pour the open cell washer with water.



This symbol shows the inflow and draining directions of the cell washer. The arrow pointing towards the cell washer shows the inflow direction. The arrow pointing away from the cell washer shows the draining direction.

This symbol demands to make sure, that the drain cover is installed in the cell washer door before you start the CW3 cell washer. If not, biological hazard is possible when contaminated samples are used.

See "5. 1. 4. 4. Drain Cover" on page 40 for removing and installation.


Caution: Federal law restricts this device to sale by or on the order with a qualified clinical facility manager or equivalent.

The CE mark states that this product is meeting all requirements for the European Economic Area.


This CSA mark states that this product is meeting all requirements for Canada and USA.

This symbol marks the manufacturer of this product.

This symbol marks the manufacturing date of this product.


This symbol marks the catalogue number of this product.


This symbol marks this product as intended to be used as an in vitro diagnostic medical device.

## 1. 5. Symbols Used in the Manual

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

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

# 2. Technical Specifications

| | |
|---|---|
| Environmental Conditions | Altitudes of up to 2000 m above sea level<br>Max. relative humidity 80% up to 31 °C;<br>decreasing linearly up to 50% relative humidity at 40 °C |
| Environmental Conditions during Storage and Shipping | Temperature: -10 °C to +55 °C<br>Humidity: 15% to 85% |
| Permissible Ambient Temperature during Operation | +2 °C to +35 °C |

| | |
|---|---|
| Average Heat Dissipation | 54 Wh / 184 Btu/h / 194 kJ/h |
| Overvoltage Category | II |
| Pollution Degree | 2 |
| IP | 20 |
| Running Time | Automatic: 1 – 99 sec / manual: 1 – 999 sec |
| Maximum Speed[2] $n_{max}$ | 3000 rpm |
| Minimum Speed[2] $n_{min}$ | 330 rpm |
| Maximum RCF-Value at $n_{max}$ | 1180 x g |
| Noise Level at Maximum Speed[1] | < 53 dB (A) |
| Maximum Kinetic Energy | 0.46 kJ |

| | |
|---|---|
| Dimensions | |
| Height (open door / closed door) | 630 mm / 410 mm |
| Width | 370 mm |
| Depth | 450 mm |
| Weight[2] | 28 kg |

[1] Front Side Measurement, 1 m in front of the instrument at 1.6 m height. 3 washing-cycles each with about 35 s centrifugation.

[2] Mode manual centrifuge

[2] Mode manual decant

# 2. 1. Directives and Standards

| Region | Directive | Standard |
|---|---|---|
| **Europe**<br>220-230 V, 50/60 Hz | **98/79/EC** In Vitro Diagnostic Medical Devices (IVD)<br>**2014/35/EU** Low Voltage (protective goals)<br>**2006/42/EC** Machinery (protective goals)<br>**2014/30/EC** Electromagnetic Compatibility (EMC) (protective goals)<br>**2011/65/EC RoHS** – Directive on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment | EN 61010-1<br>EN 61010-2-020<br>IEC 61010-2-101<br>EN 61326-1 Class B<br>EN ISO 13485 |
| **USA & Canada**<br>120 V, 60 Hz | **FDA – 510(k) cleared**<br>Regulation Name: Automated Cell-Washing Centrifuge for Immunohematology<br>Regulatory Class: 2<br>Product Code: KSN | CAN/CSA-C22.2 No. 61010-1-04<br>UL Std. No. 61010-1<br>CAN/CSA-C22.2 No. 61010-2-020-09- Part 2-020<br>IEC 61010-2-020<br>IEC 61010-2-101 |
| **China**<br>220-230 V, 50/60 Hz | | IEC 61010-1<br>IEC 61010-2-020<br>IEC 61010-2-101<br>EN 61326-1 Class B |

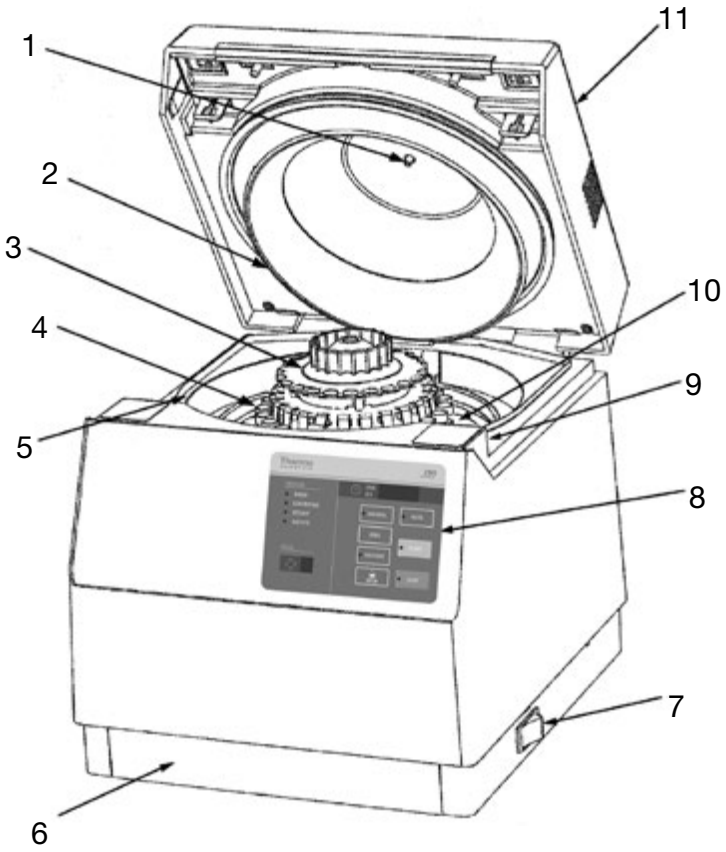
# 2. 2. Mains Supply

The following table contains an overview of the electrical connection data. This data is to be taken into consideration, when selecting the mains connection socket.

| Unit | Thermo Scientific CW3 cell washer | |
|---|---|---|
| Article No. | 75007404 | 75007405 |
| Mains Voltage | 120 V | 220-30 V |
| Frequency | 60 Hz | 50 / 60 Hz |
| Rated Current | 2.7 A | 1.5 A |
| Power Consumption | 135 W | 135 W |
| Equipment Fuse | 10 AT | 10 AT |
| Building Fuse | 15 AT | 16 AT |

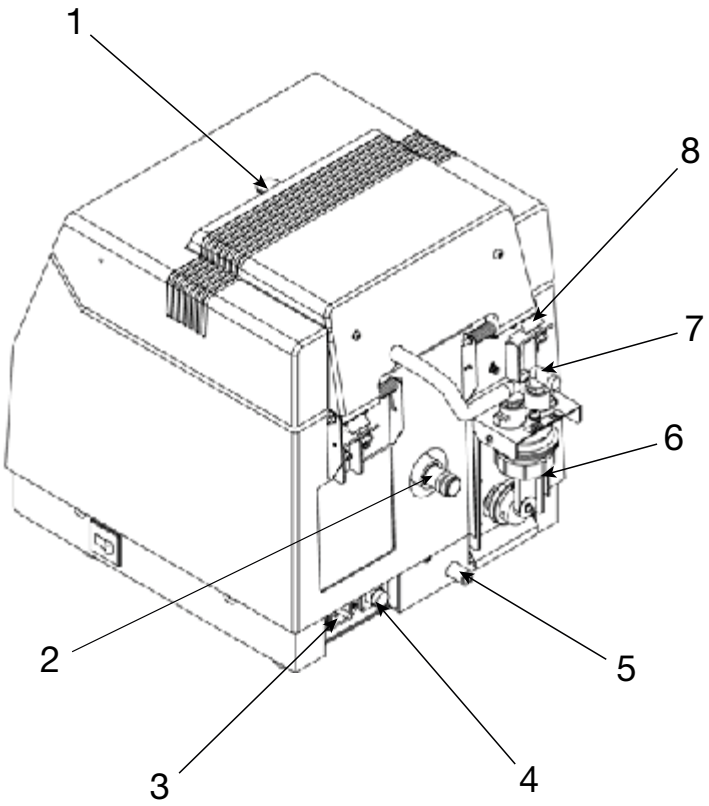
# 2. 3. Location and Function of Parts

## Front view



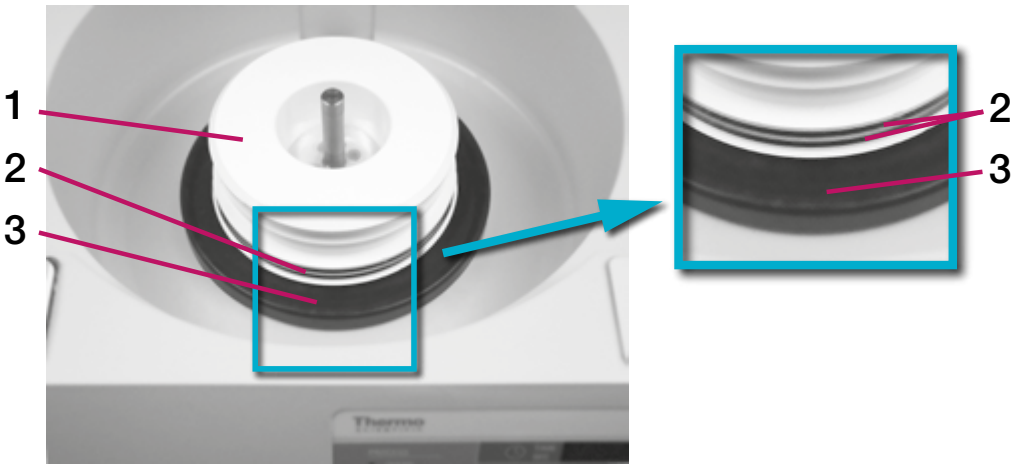

| No. | Part | Description |
|---|---|---|
| 1 | Nozzle | Through this nozzle, saline is supplied from the pump to the distributor. |
| 2 | Drain cover | Receives the waste liquid decanted from the rotor and discharges it to the outside. |
| 3 | Distributor | Distributes the saline supplied from the pump to each test tube held on the rotor. |
| 4 | Rotor | A 12 or 24-sample rotor. |
| 5 | Splash guard | Designed to keep saline, waste liquid, etc. from leaking to the internal mechanism of the cell washer. Removable. |
| 6 | Condition-setting panel | See "2. 5. Condition-setting Panel" on page 18. |
| 7 | POWER switch | Switches on and off the cell washer power. It doubles as a circuit protector. It automatically switches off the cell washer power if abnormal current passes. |
| 8 | Control panel | See "2. 4. Control Panel" on page 17. |
| 9 | Door lock lever | Keeps the door locked while the rotor is running. |
| 10 | Bowl | Rotates together with the rotor. It determines the angle to which the test-tube holders of the rotor swing. |
| 11 | Door | Test tubes are set on the rotor after opening the door. The drain cover and nozzle are installed on the back of the door. |

## Rear view



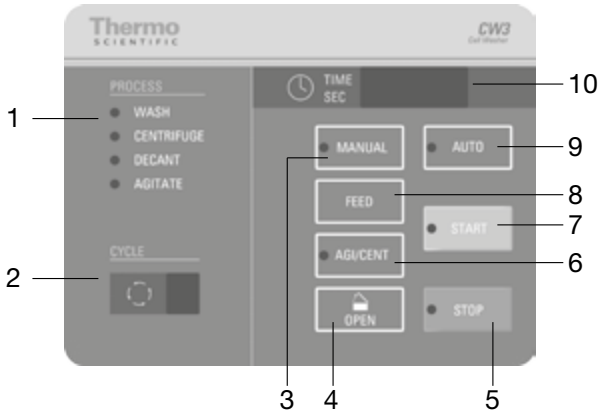

| No. | Part | Description |
|---|---|---|
| 1 | View port | You can measure the rotor speed through the view port by an optical reflection type rotation meter. |
| 2 | Drain connector | The overflowed waste liquid is drained through this connector. |
| 3 | Power connector | To be connected to a power supply. |
| 4 | Sensor connector | To be connected to the sensor which detects the level of saline in the tank. |
| 5 | Auxiliary drain tube | The chamber is drained through this tube if the drain connector is blocked. |
| 6 | Pump | Provided for supplying saline into the cell washer. |
| 7 | Pump inlet connector | To be connected to the saline tank by tubing. |
| 8 | Door stopper parts | Designed to keep the open angle (60°) of the door to prevent the door to be wide-open. |

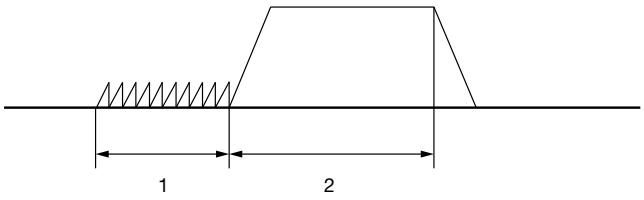
## Top view



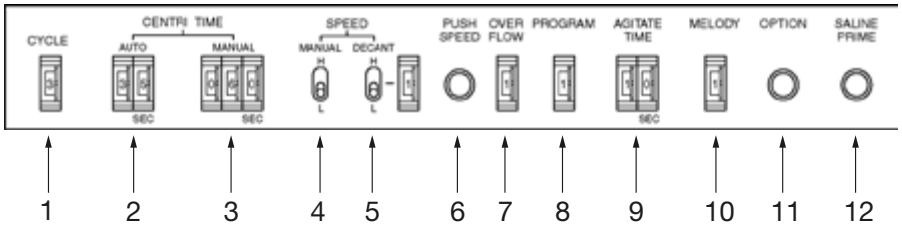

| No. | Part |
|---|---|
| 1 | Decatation coil |
| 2 | O-ring (2x) |
| 3 | Rubber gasket |

# 2. 4. Control Panel




| No. | Name | Function |
|---|---|---|
| 1 | PROCESS LED | Shows the current process of blood cell washing. Indicates the process setting in manual mode. While the cell washer operates, the LED of the active process blinks. |
| 2 | CYCLE indicator | Indicates the number of washing cycles. While the cell washer operates, the CYCLE indicator shows the number of the remaining cycles. |
| 3 | MANUAL switch | To manually start a single process (WASH, CENTRIFUGE, DECANT or AGITATE). The LED lights when the manual mode is set. |
| 4 | OPEN switch | To open the door. If it is pressed continuously, the cell washer does not accept any input of the other switches for 4 seconds (alarm buzzer sounds). |
| 5 | STOP switch | To stop a process. It is also used for stopping the end buzzer and alarm buzzer. When the operation is stopped in the automatic mode or in the agitation/centrifugation (see No. 9), the operation can be restarted at the stopped point by pressing the START switch. When the operation is stopped in the manual mode, the operation is not restarted at the stopped point by pressing the START switch.<br>The LED lights when the operation is stopped. When the operation is stopped in automatic mode, its LED blinks. |
| 6 | AGI/CENT switch | Sets the agitation time (agitation of liquid in test tubes) and the centrifugation time (manual mode) (see the figure below). Its LED lights when it is set.<br>Operation is started when START is pressed.<br>Manual-mode set speed<br>  <br><br>1 Agitation set time<br>2 Manual-mode centrifugation time<br>This cell washer does not accept the input of START when the agitation set time is 0 second. |
| 7 | START switch | To start a series of processes or a single process. |
| 8 | FEED switch | In automatic mode, it causes the value of washing cycle setting to count down. In manual mode, it is used for settings desired for one of the processes. |
| 9 | AUTO switch | To start automatic washing cycles. The LED lights when the automatic mode is set. |
| 10 | TIME indicator | Indicates the remaining time of centrifugation (in 3 digits). In case of an abnormality, the proper error code is shown. It also shows the rotor speed (×10 rpm) when PUSH SPEED on the condition-setting panel is pressed. |

# 2. 5. Condition-setting Panel




| No. | Name | Function |
|---|---|---|
| 1 | CYCLE setting switch | Sets the number of the washing cycles to be repeated (9 cycles at maximum). |
| 2 | AUTO CENTRI TIME setting switch | Sets the centrifugation time of automatic-mode operation (99 seconds at maximum). The standard centrifugation time is 35 seconds. |
| 3 | MANUAL CENTRI TIME setting switch | Sets the centrifugation time of manual-mode operation (999 seconds at maximum). |
| 4 | MANUAL SPEED setting switch | Sets one of the following rotor speeds for manual-mode centrifugation: 3,000 rpm (High) and 1,200 rpm (Low) |
| 5 | DECANT SPEED setting switch | Sets the rotor speed for automatic- or manual-mode decantation using the H/L switch and adjusting a number. If the number is set between 4 and 9, the rotor speed is the same as if 0 is set. |

| Switch | Number | | | |
|---|---|---|---|---|
| | 0 | 1 | 2 | 3 |
| H | 350 rpm | 400 rpm | 450 rpm | 500 rpm |
| L | 330 rpm | 370 rpm | 410 rpm | 450 rpm |

Decantation is completed in a short time. Note that the above value may not necessarily match the speed indicated by the PUSH SPEED switch.

If you increase the DECANT SPEED, the amount of the remained blood cells tends to decrease.

If you decrease the DECANT SPEED, the amount of the remained blood cells tends to increase.

| | | |
|---|---|---|
| 6 | PUSH SPEED switch | Keep the PUSH SPEED switch pressed when the cell washer started spinning. The actual spinning speed of the rotor will be shown (×10 rpm) on the TIME indicator on the control panel. Example: 1200 rpm are shown as 120 on the TIME indicator (120 x 10 = 1200). |
| 7 | OVERFLOW setting switch | When the pump is set to overflow the cell washer will overflow the inserted tubes with solution from the saline tank. |

| Setting | Pumping operation for overflow |
|---|---|
| 0 | No operation |
| 1 | Operates only the first cycle. |
| 2 | Operates only the first and the second cycles. |
| 3 | Operates only the first, second and the third cycles. |
| 4 | Operates only the first, second, third and the fourth cycles. |
| 5 | Operates only the first, second, third, fourth and the fifth cycles. |
| 6 to 9 | Selectable up to 9 in the same manner. |

<table>
<tr><th>No.</th><th>Name</th><th>Function</th></tr>
<tr><td>8</td><td>PROGRAM switch</td><td>Sets the operation program.
<table>
<tr><td>Setting</td><td>Program (No setting more than 1)</td></tr>
<tr><td>0</td><td>5-second centrifugation is not performed at the final process of the final cycle in automatic mode.</td></tr>
<tr><td>1</td><td>5-second centrifugation is performed at the final process of the final cycle in automatic mode.</td></tr>
<tr><td>2</td><td>You can add the conditions to the centrifugation process at manual mode:<br>▪ “3000 rpm for 15 seconds”: “H” is displayed on the CYCLE indicator and “15” is displayed in the TIME indicator.<br>▪ “1200 rpm for 60 seconds”: “L” is displayed on the CYCLE indicator and “60” is displayed in the TIME indicator.<br>See the following procedure:<br>1. Press MANUAL.<br>The condition displayed on the condition-setting panel is performed.<br>2. Press FEED.<br>Centrifugation (3000 rpm for 15 seconds) is performed.<br>3. Press FEED again.<br>Centrifugation (1200 rpm for 60 seconds) is performed.<br>5-second centrifugation is not performed at the final process of the final cycle in the automatic mode.</td></tr>
</table>
(If the dial is set between 3 and 9, the operation program is the same as that of dial setting 0.)</td></tr>
<tr><td>9</td><td>AGITATE TIME setting switch</td><td>Sets the agitation time (99 seconds at maximum).</td></tr>
<tr><td>10</td><td>MELODY setting switch</td><td>Sets the end buzzer.
<table>
<tr><td>Setting</td><td>Tunes</td></tr>
<tr><td>0</td><td>No sound</td></tr>
<tr><td>1</td><td>Electronic beep (three beeps)</td></tr>
<tr><td>2</td><td>Oh Susanna</td></tr>
<tr><td>3</td><td>My Bonnie</td></tr>
<tr><td>4</td><td>My Old Kentucky Home</td></tr>
<tr><td>5</td><td>De Camptown Races</td></tr>
<tr><td>6, 7, 8 or 9</td><td>Electronic beep (two beeps)</td></tr>
</table>
You can turn down the sound level by covering the hole with an adhesive tape (this hole is above the right side of the CYCLE setting switch).</td></tr>
<tr><td>11</td><td>OPTION switch</td><td>This is a push-button switch for saline calibration purpose.</td></tr>
<tr><td>12</td><td>SALINE PRIME switch</td><td>To be used for pump bleeding at the time of initial operation. The pump for saline supply operates while this switch is kept depressed.<br>This switch is ineffective while the cell washer is in operation.</td></tr>
</table>

# 3. Transport and Set Up

## 3. 1. Before Setting Up

1. Check the cell washer and the packaging for any shipping damage. Inform the shipping company and Thermo Fisher Scientific immediately if any damage is discovered.
2. Remove the packaging.
3. Check, if the items supplied are complete. „Items Supplied“ on page 5.
   If the items supplied are incomplete, please contact Thermo Fisher Scientific.

## 3. 2. Location

**WARNING** *The cell washer is neither inert nor protected against explosion. Never use the cell washer in an explosion-prone environment.*

**WARNING** *UV rays reduce the stability of plastics. Do not subject the cell washer, rotor and plastic accessories to direct sunlight.*

The cell washer is only to be operated indoors.

The set-up location must fulfill the following requirements:

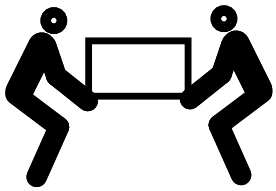
- Set up the cell washer in a room where the ambient temperature is 5 to 35 °C.
- A safety zone of at least 30 cm must be maintained around the cell washer.
  People have to stay out of this safety zone while centrifuging.
- The supporting structure must be stable and free of resonance.
- The supporting structure must be suitable for horizontal setup of the cell washer.
- The set-up location must be well-ventilated at all times.
- The cell washer is not to be exposed to heat and strong sunlight.

## 3. 3. Transporting

Due to its weight, the cell washer should be carried by at least two people. Always lift the cell washer at both sides.

To prevent possible injuries at least two people should lift and carry the cell washer by holding it at the bottom from opposite sides.

**WARNING** *Always lift the cell washer from both sides. Never lift the cell washer by its front panel, its back panel or at its door. Always remove the rotor before moving the cell washer.*



Transport the cell washer and accessories upright within the associated packaging, if possible.

**NOTICE** *The original cell washer packaging is a one way packaging. Only keep the two styropor pieces for setting up the cell washer (“3. 6. Setting Up” on page 21). Do not keep the rest of the one way packaging. Contact a shipping company or the customer service for the transport. Always remove the rotor before moving the cell washer. If you do not remove the rotor you might damage the cell washer drive or cell washer spindle.*

# 3. 4. Leveling

**CAUTION**

If the cell washer is not leveled, imbalances can occur and the cell washer can be damaged.

Do not place anything under the cell washer feet to level the cell washer.

The cell washer is to be placed in horizontal and level supporting structures or benching.

Horizontal level is to be checked when moving the cell washer to a new location.

# 3. 5. Check Mains Connection

**NOTICE**

Plug the cell washer in grounded electrical sockets only.

1. Turn off the power supply switch.
2. Check whether the cable complies with the safety standards of your country.
3. Make sure that the voltage and frequency correspond to the figures on the rating plate.

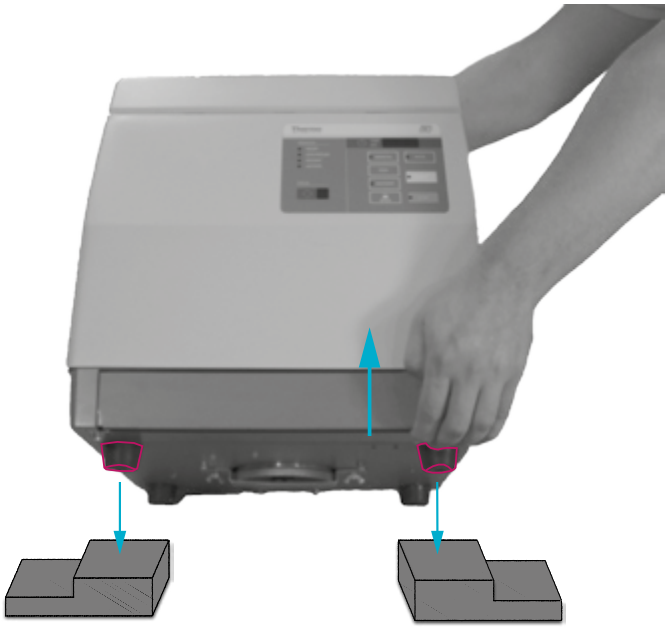
# 3. 6. Setting Up

**NOTICE**

Setting up the CW3 Cell Washer is easier when done by 2 people.

### 1. Install the motor guard plate

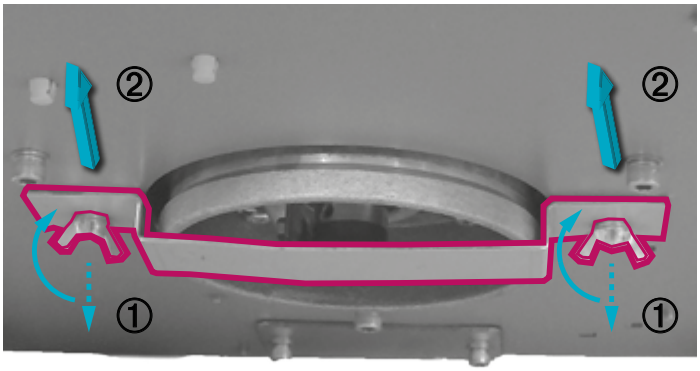
1. Lift the front bottom of the cell washer. Put the two styropor pieces from the one way cell washer packaging below the cell washer feet. Carefully put the cell washer on the styropor pieces.



2. Loose the wing nuts counterclockwise. ①

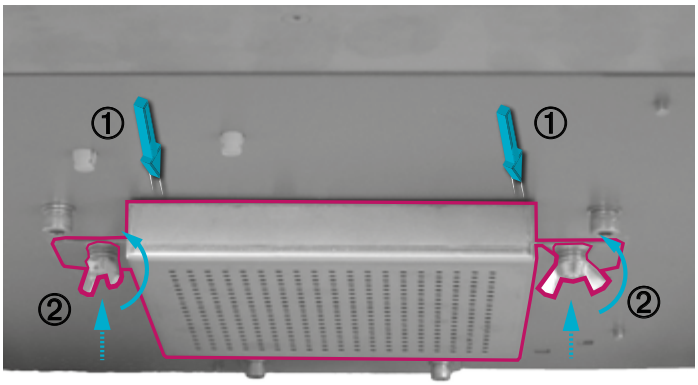
Do not unscrew the wing nuts completely to ensure easier completion of the following steps.

3. Remove the motor holder. ②




4. Place the motor guard plate. ①

5. Secure the motor guard plate with the wing nuts clockwise. ②




**NOTICE** *Keep the removed motor holder for future transportation.*

## 2. Connect power cable

Connect the power cord to the power connector at the rear of the cell washer.

Plug the power cord in the socket.

Check for grounding.

## 3. Connect sensor cable

Connect the sensor cable from the top of the tank with the sensor connector at the backside of the cell washer. (See the green highlighted sensor cable on the picture in „Connect tubing“ on page 30)

## 4. Switch on cell washer

Switch on the power supply switch.

The liquid level sensor in the tank activates. Error code “E2” (the saline tank needs to be refilled) is indicated and the buzzer sounds during the power-on. The buzzer stops as STOP is pressed or on its own after a short time.

## 5. Open lid

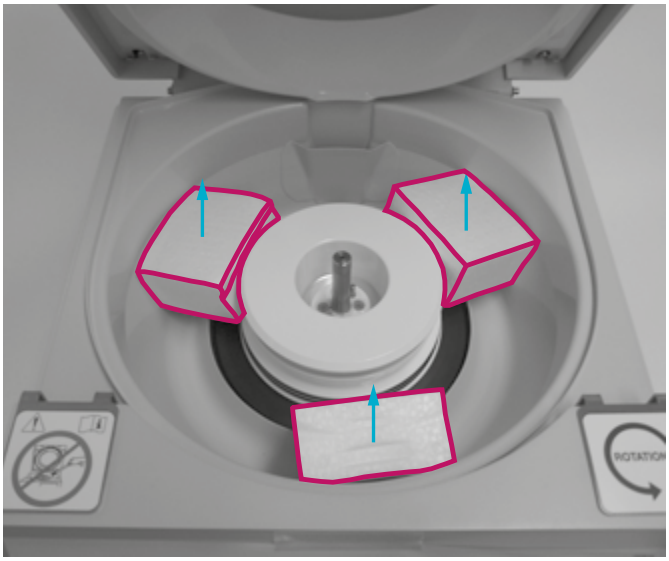
Press OPEN and open the door.

## 6. Switch off cell washer

Switch off the power supply switch.

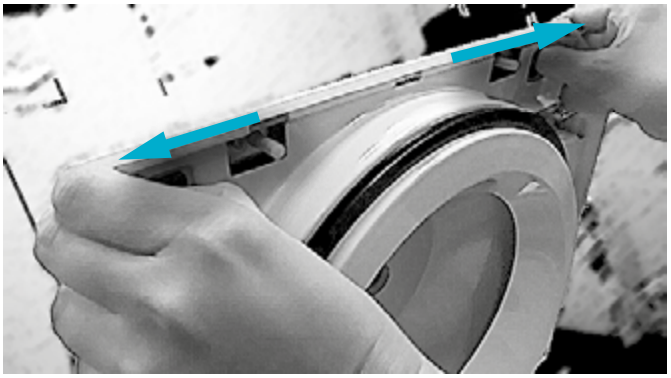
## 7. Remove packaging

Remove the packagings from the rotor chamber.



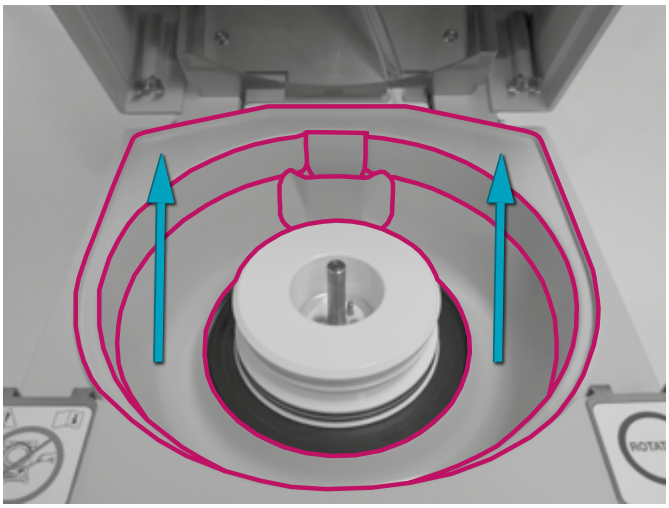
## 8. Remove the drain cover

1. Slide the pins in direction of the arrows at both sides.
2. Pull the drain cover forward to remove it.



## 9. Remove the splash guard

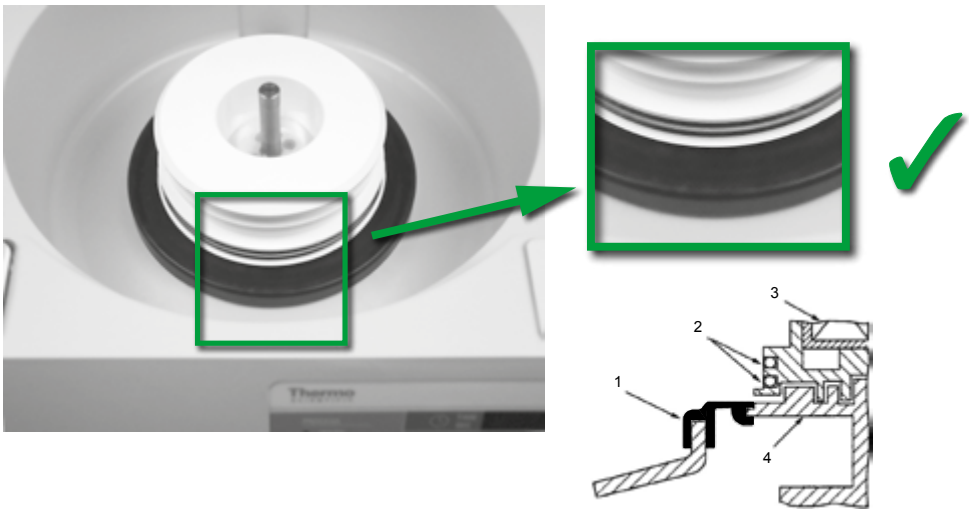
Remove the splash guard from the rotor chamber.



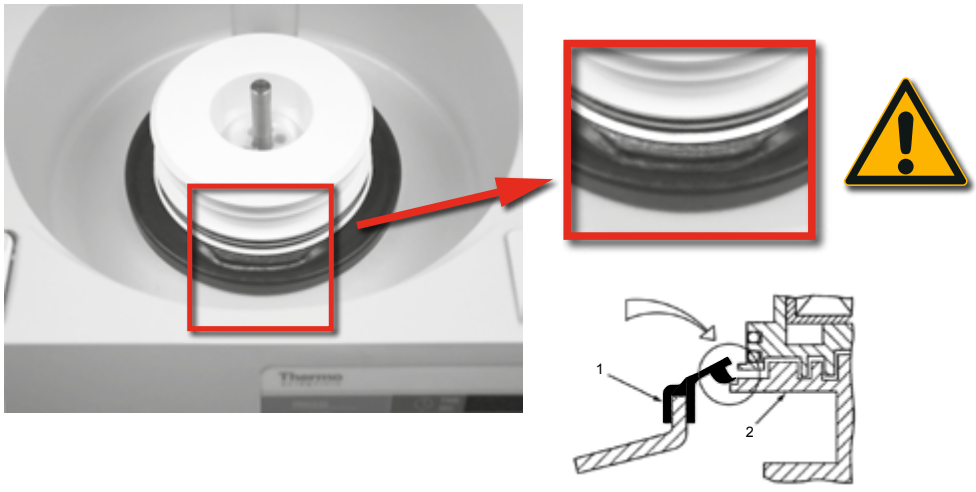
## 10. Check rubber gasket

Make sure that the rubber gasket is in position. The rubber gasket must cover the base of the decantation coil.

To get the rubber gasket in position: push the decantation coil in one direction and push the rubber gasket in the opposite direction. Do this until the rubber gasket is in position as shown in the picture.




| No. | Part |
|---|---|
| 1 | Rubber gasket |
| 2 | O-ring (2x) |
| 3 | Decantation coil |
| 4 | Magnet base |

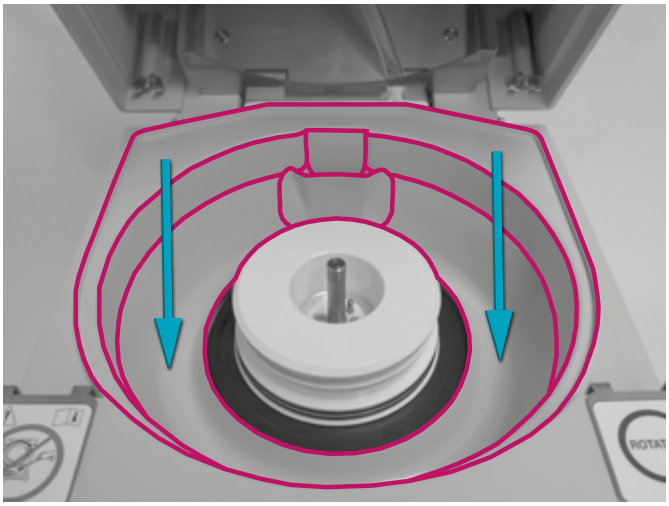



| No. | Part |
|---|---|
| 1 | Rubber gasket |
| 2 | Magnet base |

If the rubber gasket is not in position, fluids can damage the cell washer.

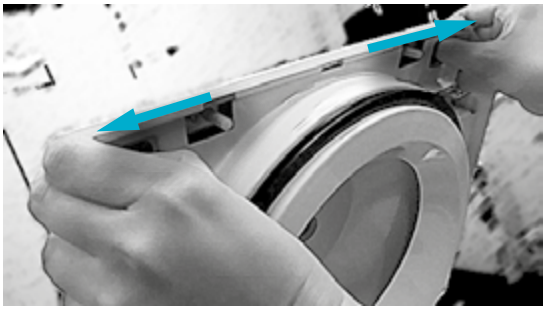
## 11. Install splash guard

Install the splash guard in the rotor chamber.



## 12. Install drain cover

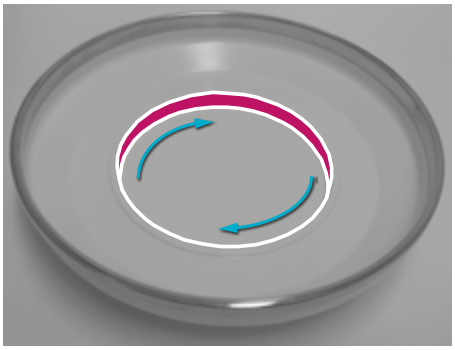
1. Insert the drain cover into the drain cover holder to install it.
2. Push the pins in the door until a click is heard.

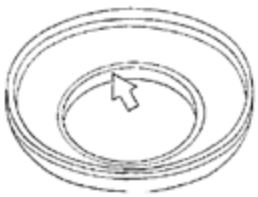


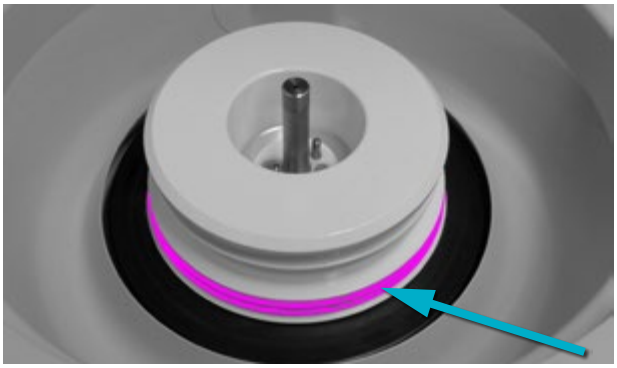
**CAUTION** *When installing the drain cover, check that the nozzle at the center of the door is put through the hole of the drain cover. Install the drain cover correctly.*

## 13. Install bowl

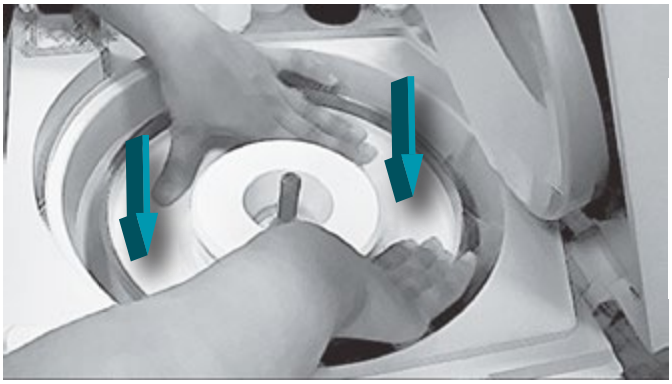
1. Lightly apply silicone grease (483719) to the inner rim of the bowl and both o-rings of the decantation coil.







2. Push the bowl down evenly with both hands.



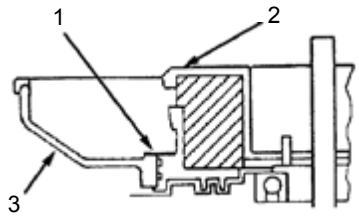
3. Push the bowl all the way down until the bottom of the decantation coil becomes even with the bottom of the bowl. Make sure that they are even by passing fingers over the surface.

**NOTICE** *The bowl must be installed correctly and aligned with the decantation coil before performing a test run. Make sure that the surface of the decantation coil and the surface of the bowl are at the same level. Both o-rings are visible if the bowl is installed correctly.*

*If the bowl is not installed correctly, the door lock will not work, the door cannot be opened, the bowl will contact the drain cover and the cell washer will be out of order. If you set the bowl correctly, the tube holders will touch the metal part of the bowl when the rotor is installed.*

*Check that the bowl can be turned freely. If the bowl cannot be turned freely, the rubber gasket might not be mounted properly. Error message E14 or E16 might be displayed if the bowl is not installed correctly („Check rubber gasket“ on page 24).*

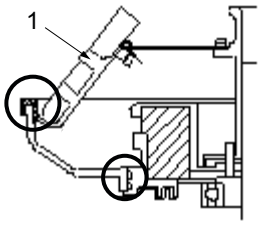
**Cross Section**




1 – Flush

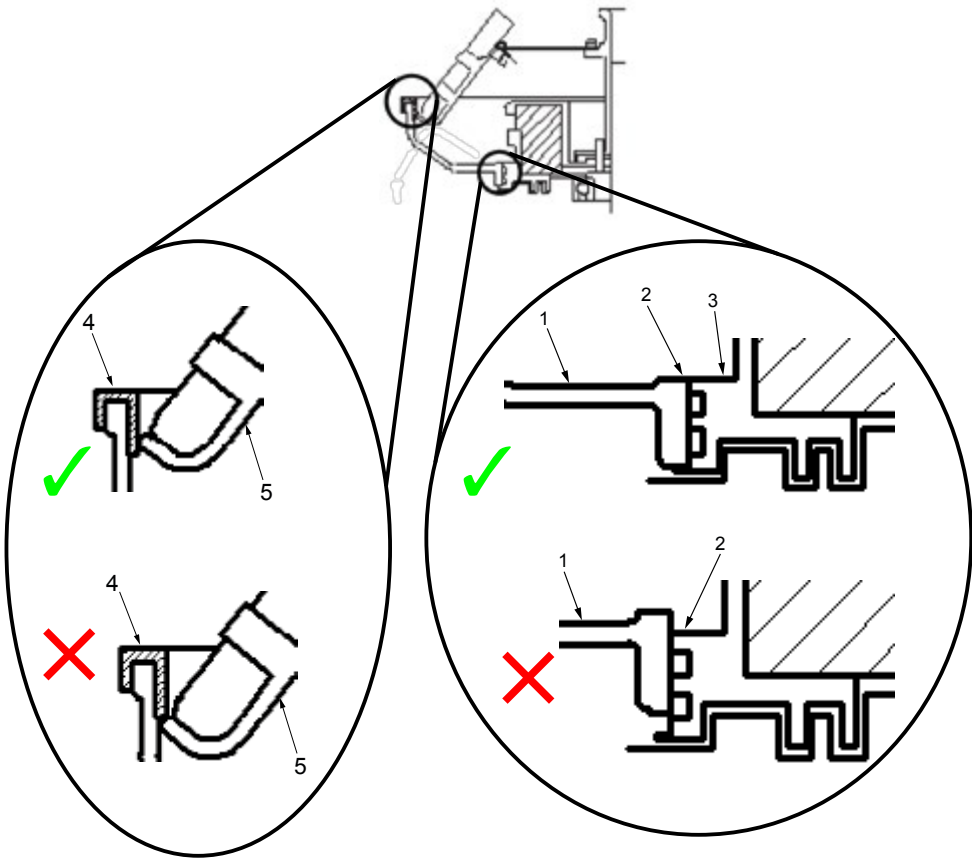
2 – Decantation coil

3 – Bowl




1 – Tube holder

**Detail View**




1 – Bowl

2 – Flush

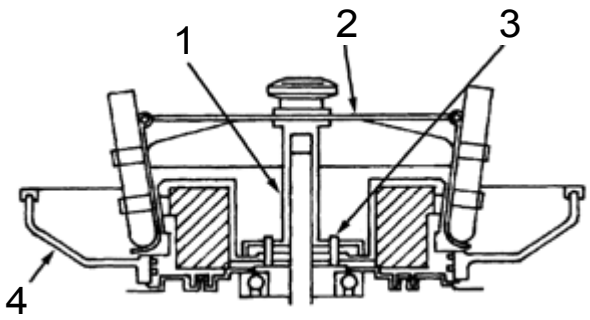
3 – Decantation coil

4 – Bowl

5 – Tube holder

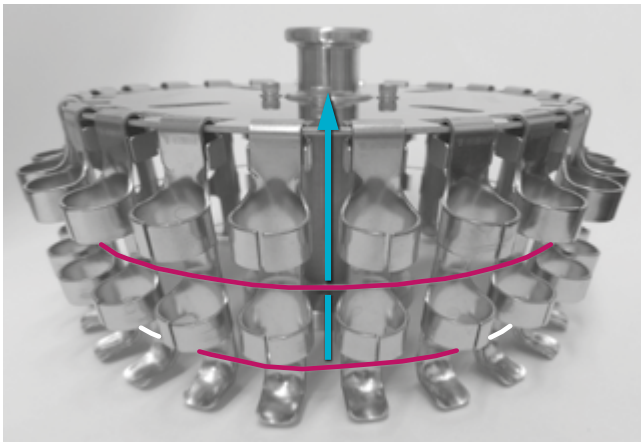
## 14. Install rotor

**NOTICE** *The rotor is just set on the drive shaft. The rotor is not screwed down or otherwise tightend to the drive shaft.*




| No. | Part |
|---|---|
| 1 | Drive shaft |
| 2 | Rotor |
| 3 | Coupling pins |
| 4 | Bowl |

1. Remove the rubber bands from the rotor.



2. Set the rotor on the drive shaft.
3. Turn the rotor about a quarter so that the coupling pins are inserted into the rotor shaft holes.
4. Turn the top of the rotor clockwise and counterclockwise to check that the coupling pins are inserted into the rotor shaft holes (no free turn) after setting.

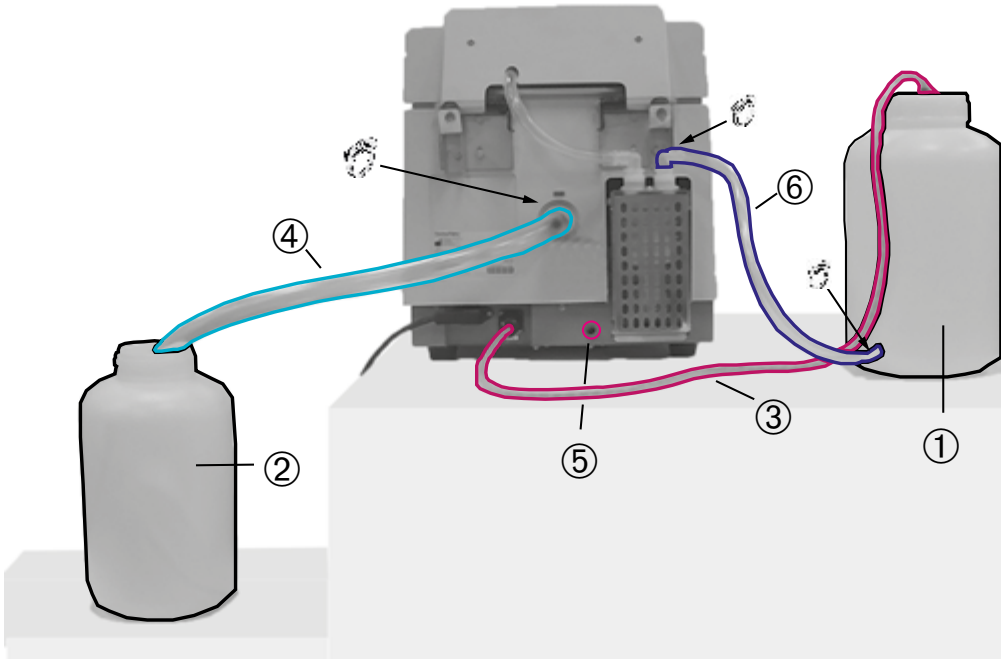
**CAUTION** *If the rotor is not set correctly, the rotor holder may come off the bowl and overswing.*

## 15. Install distributor

Set the distributor on the top of the rotor.

Make sure that the coupling pins at the bottom of the distributor move in the holes at the top of the rotor.

## 16. Connect tubing




| | |
|---|---|
| ① | Saline tank |
| ② | Waste drain |
| ③ | Sensor cable |
| ④ | Drain tube |
| ⑤ | Gray outlet |
| ⑥ | Inlet tube |

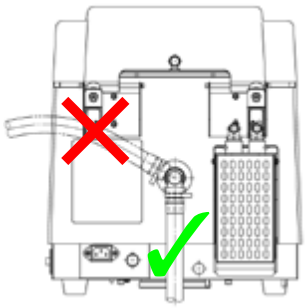
1. Do not set the saline tank at a place higher than the cell washer. ①
2. Put the waste drain at a place lower than the cell washer. ②

   Make sure that the waste drain is lower than the cell washer to prevent backward flow of waste liquid.

   Prepare the saline tank and a drain for waste following your laboratory standards. A waste liquid tank is shown as an example in the picture.
3. Connect the sensor cable of the saline tank to the connector at the rear of the cell washer. ③
4. Connect the drain tube or the L-shaped adapter, which can be connected to the drain tube, to the drain connector. ④
   Apply a thin layer of grease (483719) to the inner side of the tubing or the outer side of the connector. Do not force the drain tube or the L-shaped adapter into the drain connector.

   Tighten it with the hose band (big).

   Hold the L-shaped adapter facing downward and connect it to the drain connector. If not waste liquid can stow and result in bad drainage.



Make sure to position the L-shaped adapter correctly.

Place the end of the drain tube in the waste liquid tank or a sink. Position them higher than the liquid level.

5. The gray outlet at the rear center of the cell washer is used for draining off waste liquid from the chamber. ⑤ After blood cell washing, waste liquid keeps draining off through the connector. The auxiliary drain tube under the connector is to drain waste liquid flowed from the chamber into the vicinity of the driving motor. Waste liquid may not always drain off through it. Prepare a drain or tank for waste liquid coming out of the auxiliary drain tube of the rear of the cell washer when operated. Instead of preparing an additional drain or tank for waste liquid, you may lengthen the tube (You can use the rest of the tube of the tank). You can insert the tube in the waste liquid drainage you use for the drain tube.

**CAUTION** *Make sure that the tips of the drain tubes are above the waste liquid level in the tank. Otherwise, the chamber cannot be drained completely and waste liquid stagnates in the chamber because of poor drainage. Poor drainage can also be caused if the tube is bent or flattened or if waste liquid stagnates in the middle of the tube. Set the tubes properly so that waste liquid drains off smoothly. Be careful not to set the drain tubes at a place higher than the drain outlet of the cell washer.*

6. Connect the saline tank to the pump inlet connector of the cell washer. ⑥

   Apply a thin layer of grease (483719) to the inner side of the tubing or the outer side of the connector.

   Connect the tubing to the pump inlet connector. Tighten it with the hose band (medium).

   Connect the tubing with the nozzle of the tank carefully. Tighten it with the hose band (small).

   If it is not connected using the hose bands liquid can leak from the tube and might get inside of the cell washer. If the liquid might have leaked into the inside of the cell washer, contact a Thermo Fisher Scientific authorized sales/service representative for cleaning and drying the cell washer.

# 3. 7. Storage

**WARNING** *If necessary clean, disinfect or decontaminate the entire system when removing the cell washer and accessories from use. In doubt contact the Thermo Fisher Scientific customer service.*

- Before storing the cell washer and the accessories, it must be cleaned and if necessary desinfected and decontaminated.
- Cell washer and accessories have to be thoroughly dried before storage.
- Store the cell washer in a clean and dust-free location.
- Be sure to place the cell washer on its feet.
- Avoid direct sunlight.

# 3. 8. Shipping

**WARNING** *Before shipping the cell washer and accessories you have to clean and if necessary disinfect or decontaminate the entire system. In doubt contact the Thermo Fisher Scientific customer service.*

Before shipping the cell washer please bear the following in mind:

- The cell washer must be clean and decontaminated.
- The decontamination must be confirmed in a decontamination certificate ("Decontamination Information Certificate" on page 45). Contact customer service for more details.
- Install the motor holder for shipping.

# 4. Operation

**WARNING**

Use the cell washer only with correct installed rotor, distributor assembly and correct inserted bowl, splash guard and drain cover.

Hazardous substances can leak out of the cell washer, if bowl and drain cover are missing.

**CAUTION**

Open the door carefully after blood cell washing. Otherwise the remaining waste liquid from the inside of the drain cover might splash.

**CAUTION**

Close the door by pushing down at the forward center of the door until a short beep is heard.

If the door is closed insufficiently, an alarm (E1: DOOR OPEN) is indicated and the cell washer does not start operation. If this alarm is indicated, close the door and press START again.

## 4. 1. Preparation

1. Prepare the test tubes (10 or 12 mm in diameter and 75 mm in length). When using the test tubes 10 mm in diameter, set the attached D10 adapter to the rotor holder. Make sure that the brim of the adapter is pointing outwards.

   **CAUTION** *Be sure to use specified test tubes with a wall thickness of 1mm or more. Test tubes with wall thickness less than 1mm, such as disposable test tubes, are still acceptable to be used as long as the tubes are free from scratches, cracks, warping or other abnormalities that may compromise the structural integrity of the tubes under the centrifugal force exerted by this device, and are not re-used after their initial use is complete. It is recommended to use tempered glass test tube for this cell washer.*

2. Check and prepare the saline tank and a drain for waste following your laboratory standards.

   **CAUTION** *Make sure that the tips of the drain tubes are above the waste liquid level in the tank. Otherwise, the chamber cannot be drained completely and waste liquid stagnates in the chamber because of poor drainage. Poor drainage can also be caused if the tube is bent or flattened or if waste liquid stagnates in the middle of the tube. Set the tubes properly so that waste liquid drains off smoothly. Be careful not to set the drain tubes at a place higher than the drain outlet of the cell washer.*

### 4. 1. 1. Injection Volume Adjustment and Pump Ventilation

#### Adjustment of saline injection volume

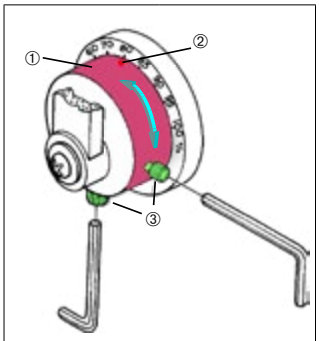
The CW3 cell washer is factory-adjusted to the injection volume of saline for use with the 24 place rotor and the 12 mm diameter test tubes.

When using the 24 place rotor and 12 mm diameter test tubes with this cell washer, there is no need to adjust the injection volume. When using the 12 place rotor or 10 mm diameter test tubes, adjust the flow rate of the pump as follows:

1. Remove the protective cover of the pump at the rear of the cell washer (it is secured with two screws).
2. Loosen the two locking screws of the pump counterclockwise.
3. Turn the adjusting screw to set the indicator value appropriate to your rotor and tube settings.
4. Tighten the two locking screws clockwise.

Reference (Index of injection volume)

| Rotor | Test tube | Injection volume (+/- 10%) | Indicator setting |
|---|---|---|---|
| 12 place | 12 mm diameter | 48 ml | 45 % |
| 12 place | 10 mm diameter | 32 ml | 30 % |
| 24 place | 12 mm diameter | 96 ml | 80 % |
| 24 place | 10 mm diameter | 64 ml | 60 % |




| | |
|---|---|
| ① | Adjusting screw |
| ② | Indicator (red dot) |
| ③ | Locking screws |

5. Saline calibration
   a. Press OPTION with a beaker held against the nozzle. The saline pump runs for 5 seconds.
   b. Compare the preset volume in the above table and the actual volume injected in the beaker.
   c. Set the adjusting dial screw when the actual volume is not in the preset volume range.
      Repeat step a and b until calibration is succesful.
6. Reinstall the protective cover of the pump.

## Pump ventilation

Fill the saline tank with saline. Hold a beaker or other container to the nozzle. Press SALINE PRIME on the condition-setting panel that is located at the front bottom of the device to discharge saline from the nozzle until no bubbles come out of the nozzle.

## 4. 1. 2. Setting the Operating Conditions

The operating conditions are factory-set as follows.

| Setting dials and switches | Factory-setting |
|---|---|
| 1 CYCLE | 3 cycles |
| 2 AUTO CENTRI TIME | 35 seconds |
| 3 MANUAL CENTRI TIME | 60 seconds |
| 4 MANUAL SPEED | L (1200 rpm) |
| 5 DECANT SPEED | H-1 (400 rpm) |
| 6 OVERFLOW | 1 (Operates only the first cycle) |
| 7 PROGRAM | 1 (5-second centrifugation is performed at the final cycle in automatic mode) |
| 8 AGITATE TIME | 5 seconds |
| 9 MELODY | 1 (Electronic beep (three beeps)) |

Agglutination of blood cells is influenced by centrifugal force and centrifugation time. If centrifugal force and centrifugation time are insufficient, agglutination can be insufficient causing incorrect results. Excessive centrifugation can harden the blood cells causing incorrect agglutination or difficult resuspension. The weak reaction may disappear. Centrifugal conditions are influenced by the amount of blood cells, specific gravity of blood cells, etc. The above settings are just a guide. Determine the optimum conditions according to the following evaluation.

1. The supernatant is transparent and no blood cell is suspended after centrifugation.
2. The blood cells that are precipitated at the bottom of the test tubes show clear outlines after centrifugation.
3. The blood cells are easily removed from the bottom and disentangled by a light agitation after decantation.
4. Check the reaction using reagents whether negative or positive.
5. Check the amount of the remained blood cells. If the amount of the remained blood cells is small, lower the DECANT SPEED.

## 4. 1. 3. Preparation of the Sample

**⚠ CAUTION**

When the sample or liquid spilled, it can leak into the cell washer.

If the sample or liquid leaked into the cell washer, contact Thermo Fisher Scientific service for cleaning and drying.

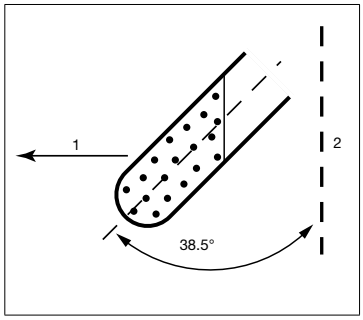
### Blood cell washing

Use one or two drops (about 50 µl) of 3-5% erythrocyte suspension in one test tube.

**CAUTION** *When centrifuging precipitated erythrocyte layer, use one or two drops (about 50 µl or less) per test tube. If not a series of blood cell washing processes can be not complete.*

### Centrifugation

Use the 80% or less of the test tube capacity as sample volume for centrifugation. The tubes are centrifuged at an angle of 38.5°.




1 Centrifugal force
2 Drive shaft

# 4. 2. Operation Modes

## 4. 2. 1. Automatic Mode

| Step | Operation | Description |
|---|---|---|
| 1 | Switch on AUTO. | AUTO lights up.<br>The automatic mode is selected automatically when the power switch is switched on. |
| 2 | Switch on START. | START lights up.<br>To stop the cell washer temporarily in the middle of a process, press the STOP switch and the cell washer stops at once.<br>For restarting the process, press the START switch. |
| 3 | Upon finish of all processes | The end buzzer sounds and START lights off.<br>The door is opened.<br>The buzzer stops as STOP is switched on. |

**NOTICE** *In automatic mode, the set number of cycles can be decreased if you push* FEED. *For example, if three cycles are set, the number changes 3→2→1 as* FEED *is pressed.*

## 4. 2. 2. Manual Mode

In manual mode the process steps (WASH, CENTRIFUGE, DECANT, AGITATE) can be run as single process steps. More information on the single process steps: „Operational Sequence for Antiglobulin Test“ on page 37.

| Step | Operation | Description |
|---|---|---|
| 1 | Switch on MANUAL. | MANUAL lights up. |
| 2 | Press FEED once or multiple times to set the desired process manually.<br>The LED of the set PROCESS lights up. | The CENTRIFUGE process is set preferentially.<br>Possible process steps:<br>1. DECANT - Pressing FEED once (1x) will set the DECANT process. The according LED lights up.<br>2. AGITATE - Pressing FEED twice (2x) will set the AGITATE process. The according LED lights up.<br>3. WASH - Pressing FEED three times (3x) will set the WASH process. The according LED lights up.<br>4. CENTRIFUGE - Pressing FEED four times (4x) will set the CENTRIFUGE process as set preferentially when MANUAL is pressed. The according LED lights up.<br>Make sure that the desired values on the condition-setting panel for the manually set process step are set. |
| 3 | Switch on START. | START lights up. |
| | Upon finish of the selected process | The end buzzer sounds and the door is opened.<br>START lights off. |

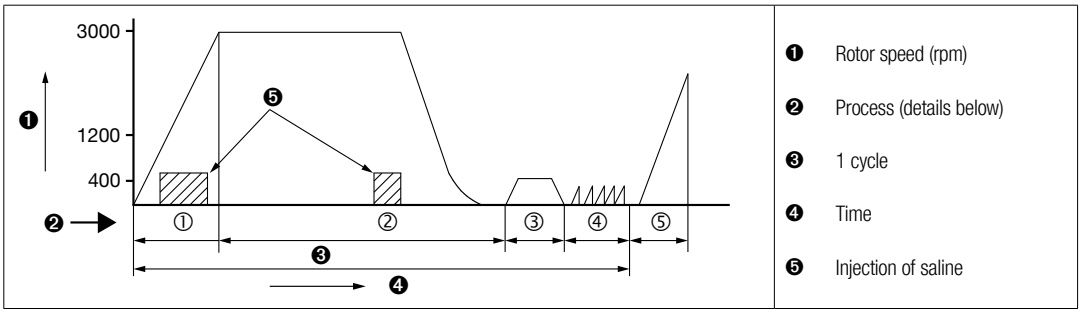
**NOTICE** *The door is automatically opened after the rotor is stopped by pressing* STOP *in the middle of operation.*

**NOTICE** *When power fails during operation and then it is restored, or when* POWER *is switched off during operation and then turned on again, the automatic-mode operation is set (*AUTO *lights up) and the cell washer stops. In such cases, set the desired process again and perform operation in the manual mode.*

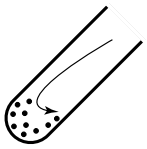
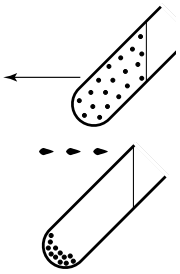
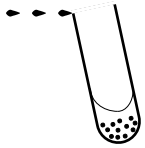
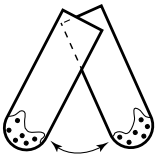
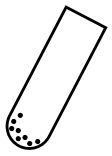
## 4. 2. 3. Agitation-Centrifugation

| Step | Operation | Description |
|---|---|---|
| 1 | Switch on AGI/CENT. | AGI/CENT lights up. |
| 2 | Switch on START. | START lights up.<br>To stop the cell washer temporarily in the middle of a process, press STOP. For restarting the process, press START. |
| 3 | Upon finish of the process | The end buzzer sounds and START lights off.<br>AGI/CENT lights up and the door is opened. |

# 4. 2. 4. Operational Sequence for Antiglobulin Test




Washing cycle repeated 3 or 4 times

| Process | Operation | Description | Reference Illustration |
|---|---|---|---|
| ① | WASH | A fixed amount of saline is pumped into the distributor when the rotor speed reaches 1200 rpm. The saline is injected by centrifgual force from the distributor into the test tubes. The blood cells in the test tubes are sufficiently suspended in the saline. |  |
| ② | CENTRIFUGE | Blood cells are centrifuged.<br>The standard centrifugation time is 35 sec. (selectable). Before the rotor decelerates, the injection of saline continues to overflow the test tubes.<br>(Overflow is also selectable.) |  |
| ③ | DECANT | The rotor spins at low speed with the rotor holder kept at an angle to slightly open its top end by magnetic force. By this operation only the saline decants from the test tubes and the blood cells remain. |  |
| ④ | AGITATE | The rotor repeats rotation and stops at short, quick intervals to disentangle the remaining blood cells. |  |
| ⑤ | CENTRIFUGE | The rotor spins about 5 seconds to collect the blood cells adhered to the wall surfaces of the test tubes at the bottom. This is done to ensure the reaction with the Antiglobulin reagent. This operation is performed at the end of the washing cycle. |  |

# 5. Maintenance

**WARNING**

Cell washer, rotor or accessories can be contaminated by samples.

Decontaminate according to good laboratory procedures and methods.

**WARNING**

If there is a possibility that the cell washer, rotor, or an accessory is contaminated by samples that might impair human health (for example, samples that are toxic or radioactive, or blood samples that are pathogenic or infectious), it is your responsibility to sterilize or decontaminate the cell washer, rotor, or the accessory correctly before requesting repairs from Thermo Fisher Scientific service. Note that Thermo Fisher Scientific can not repair the cell washer, rotor or the accessory unless sterilization or decontamination is completed.

**WARNING**

It is your responsibility to sterilize and/or decontaminate the cell washer, rotor, or parts correctly before returning them. In such cases copy the decontamination sheet at the end of this manual, fill it out and attach it to the item to be returned. Thermo Fisher Scientific may ask you about the treatment for the cell washer, rotor or the part if the decontamination is checked and judged as insufficient by Thermo Fisher Scientific. It is your responsibility to bear the cost of sterilization or decontamination. Note that Thermo Fisher Scientific can not repair or inspect the cell washer, rotor or the accessory unless sterilization or decontamination is completed.

**CAUTION**

Do not operate the cell washer in any manner not described in this instruction manual. Should you have any troubles with the cell washer, call Thermo Fisher Scientific service.

## 5. 1. Cleaning

**NOTICE**

Information provided is to be considered as general guideline and may vary depending on the usage of the unit.

If you use other cleaning methods than those described here, make sure that the necessary cleanliness is achieved according to your requriements.

## 5. 1. 1. Pump, Tank and Tubing

**CAUTION** *If saline is contaminated by bacteria, it may cause hemolysis or poor result.*

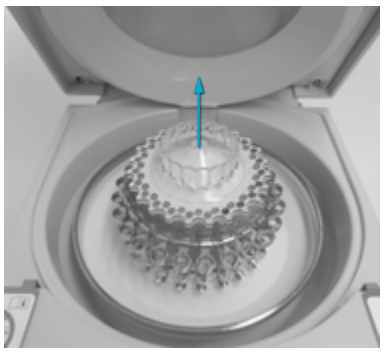
- Wash the inside of the tank and the tubing on a regular basis.
- If the cell washer is not used for a long period, drain out saline from the tank, tubing and pump.
- Check the volume of saline inside the tank before operation. Connect the tube securely to the saline tank and the pump inlet connector with the hose bands. When the tube is loose, replace it.
- Make sure that all tubing is connected and free from obstructions.

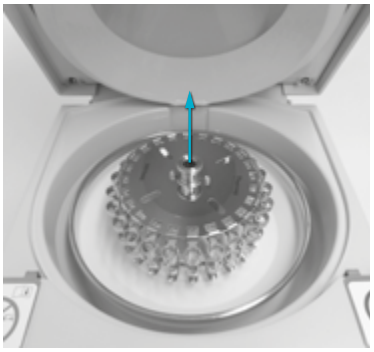
### Washing

1. Fill up the saline tank with washing solution (0.5% Sodium Hypochlorite Solution).
2. Fill up the fluid passage with washing solution according to the same procedure as pump ventilation ("4. 1. 1. Injection Volume Adjustment and Pump Ventilation" on page 33).
3. Flush the tubing by running through four wash cycles. Do not run wash cycles without the rotor and distributor installed. Damage to the bearing may result.
   Replace the washing solution in saline tank with distilled water
4. Flow distilled water 2 to 3 liters from the saline tank according to the same procedure as pump bleeding.
5. Exchange distilled water in the saline tank with saline.
6. Flow saline 2 to 3 liters from the saline tank in the same manner as described in point 4.

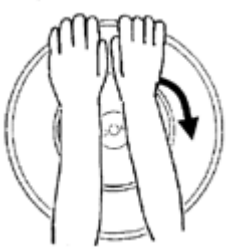
## 5. 1. 2. Rotor, Distributor and Bowl

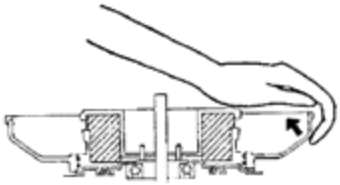
After operation remove the rotor, distributor and bowl. Wash and dry them well.





To remove the bowl hold it with both hands. Remove the bowl by lifting it. Slowly rotating the bowl makes it easier to lift it.





See the following table for cleaning.

| Part | Cleaning |
|---|---|
| Rotor | Soak in washing solution (0.5% sodium hypochlorite solution). Wash and dry. |
| Distributor, bowl | Soak in washing solution (0.5% sodium hypochlorite solution) within 1 hour. Wash and dry. |

**CAUTION** *The distributor is made of polycarbonate. For cleaning make sure that you use washing solution (0.5% sodium hypochlorite solution) or the distributor might deteriorate. Use neutral detergent (pH 6 to 8). Do not dip the distributor in the diluted detergent solution for a long time or the strength of the distributor can decrease.*

## 5. 1. 3. Chamber, Splash Guard, Drain Cover and Door Stopper Parts

Remove the splash guard and the drain cover from the cell washer. Wash and dry them well.

Use washing solution (0.5% sodium hypochlorite solution) for cleaning. When washing the inside of the chamber, be careful not to pour washing solution on the decantation coil. Wipe the decantation coil with a cloth or paper moistened with washing solution.

## 5. 1. 4. 4. Drain Cover

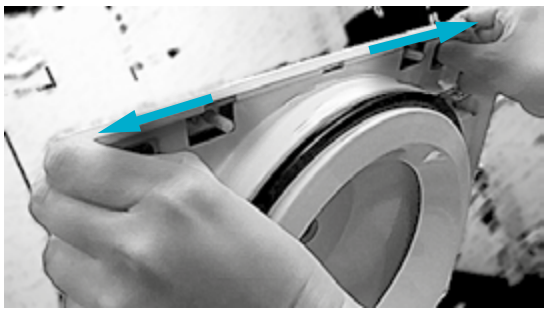
### Removing

1. Slide the pins in direction of the arrows at both sides.
2. Pull the drain cover forward to remove it.

### Mounting

1. Insert the drain cover into the drain cover holder to install it.
2. Push the pins in the door safely until a click is heard.

**CAUTION** *When installing the drain cover, check that the nozzle at the center of the door is put through the hole of the drain cover. Install the drain cover correctly.*



## 5. 1. 5. 5. Splash Guard

### Removing

1. Remove the drain cover. See "5. 1. 4. 4. Drain Cover" on page 40.
2. Remove the distributor, rotor and bowl.
3. Remove the splash guard by pulling it up.

### Mounting

1. Insert the splash guard.
2. Install the distributor, rotor and bowl. See "3. 6. Setting Up" on page 21.
3. Mount the drain cover. See "5. 1. 4. 4. Drain Cover" on page 40.

**CAUTION** *Do not store washing solution in the chamber. Do not spill washing solution on the decantation coil or liquid can leak into the cell washer causing a failure.*

If a test tube is broken, be sure to remove the fragments inside the chamber and the drain tube of the drain cover thoroughly with a brush.

## 5. 1. 6. 6. Checking and Replacing the Door Stopper Parts

If you observe the below, call a service technician.

1. The rubber mount cracks or deteriorates.
2. The door keeps being wide-open after you open the door.

If the door keeps being wide-open, drops of waste liquid on the drain cover might fall on the rear of the cell washer.

## 5. 2. Preventive Maintenance

- Replace the drain tube and the tube every 1 to 3 years depending on the degree of discoloration.
- The pump is a replacement part. Liquid may leak from the bellows of the pump because of deterioration. Deterioration depends on the installation environment such as ultraviolet rays and temperature. We highly recommended to replace the bellows of the pump (S413230A) every three years.
- Replace the carbon brushes of the motor after 7 years of use (assuming 30 runs per day).

## 5. 3. Shipping and Disposal

**WARNING**

When removing the centrifuge and accessories from use for disposal

you have to clean and if necessary disinfect or decontaminate the entire system. In doubt contact the Thermo Fisher Scientific customer service.

For the disposal of the centrifuge mind the regulations in your country. Contact the Thermo Fisher Scientific Customer Service for the disposal of the centrifuge. For contact information check the backpage of this manual or visit www.thermofisher.com/centrifuge

For the countries of the European Union the disposal is regulated by the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC.

Mind the information on transport and shipping ("3. Transport and Set Up" on page 20, "3. 8. Shipping" on page 32).

# 6. Troubleshooting

## 6. 1. Mechanical Emergency Door Release

| ⚠ | CAUTION |
|---|---|
| Opening the door while the rotor spins is very dangerous. Never unlock the door while the rotor spins. If the door is opened while the rotor still spins, close the door immediately. Do not run the cell washer with the allen wrench inserted in the hole of the cell washer. | |

The door can not be opened and closed except when the cell washer is switched on and the rotor has stopped. If the door can not be opened because of a power failure, open the door according to the following procedure.

1. Check that the rotor does not spin.

   Listen carefully to make sure that no spinning sound is heard.

   It takes about one minute until the rotor spinning at 3,000 rpm (maximum speed) stops completely. Wait for a sufficient time.

2. Insert the attached allen wrench into the small hole to unlock the door.

   A small hole is provided on both sides of the cell washer.

   Insert the attached allen wrench straight into the small hole and push it in until a click is heard. Then insert the allen wrench into the small hole of the other side in the same manner. The door unlocks and opens.

# 6. 2. Error Codes

If any abnormality occurs during operation, corresponding error code blinks on the TIME indicator, the alarm buzzer sounds, and the cell washer stops. Take the action described in the following table or contact Thermo Fisher Scientific service.

| Error code | Desciption | Troubleshooting |
|---|---|---|
| E1 | The door is open. | Close the door safely and press START. |
| E2 | The saline tank needs to be refilled. | Refill the tank and press STOP to clear the error code. In the manual mode, CENTRIFUGE and DECANT processes can be executed even when this error code is shown.<br>The liquid level sensor may be faulty if the alarm buzzer sounds even though there is enough saline. Contact a Thermo Fisher Scientific authorized sales/service representative for repair. The error code can be temporarily cleared by pressing MANUAL and STOP simultaneously for three seconds or more (operation in automatic mode is possible). It returns to the original state by turning on and off the power switch. |
| E3 | A power failure occurs. | If a power failure occurs while the cell washer is running, the cell washer stops spinning after the power failure and the error code “E3” is shown.<br>In order to clear the error code, press any of the switches on the control panel after a lapse of one minute or more from when the error code is indicated. If the error persists, contact Thermo Fisher Scientific service.<br>This error can be caused by voltage drop if your cell washer is connected to an outlet to which multiple appliances are connected when the rotor accelerates. Turn off the cell washer power and connect the cell washer to an outlet that can supply stable voltage to the cell washer. |
| E4 | The power supply is incorrect. | The frequency of the power supply is incorrect. Turn off the power switch and on again. If the error persists, contact Thermo Fisher Scientific service. |
| E5 | The rotor overspeeds. | This error code is shown when the rotor runs at a speed higher than the specified speed. Contact Thermo Fisher Scientific service. |
| E6 | An incorrect current flows. | This error code is shown when an incorrect current flows in the circuit. Contact Thermo Fisher Scientific service. |
| E7 | The speed sensor is defective. | The sensor to detect the rotor speed is defective. Contact Thermo Fisher Scientific service. |
| E8 | The current sensor is defective. | The sensor to detect the current is defective. Contact Thermo Fisher Scientific service. |
| E9 | The RAM is defective. | Turn off and on the power switch. If the error persists, the microcomputer of the cell washer to control its operation is defective. Contact Thermo Fisher Scientific service. |
| E10 | The rotor overspeeds (hardware detection). | This error code is shown when the rotor runs at a speed higher than the specified speed. Contact Thermo Fisher Scientific service. |
| E11 | The triac is defective. | The element on the circuit board is defective. Contact Thermo Fisher Scientific service. |
| E14 | Set up might be wrong, lid lock not engaging. | Check if the rubber gasket and the bowl are installed correctly. „Check rubber gasket“ on page 24 and „Install bowl“ on page 25. If the error still occurs, contact Thermo Fisher Scientific service. |
| E16 | Set up might be wrong, motor not turning. | Check if the rubber gasket and the bowl are installed correctly. „Check rubber gasket“ on page 24 and „Install bowl“ on page 25. If the error still occurs, contact Thermo Fisher Scientific service. |
| Others | System error | Contact Thermo Fisher Scientific service. |

# 6. 3. Troublshooting when no Error Code is indicated

**WARNING**

Unauthorized disassembly of the cell washer except by Thermo Fisher Scientific service is strictly prohibited.

| No. | Symptom | Possible cause | Remedy |
|---|---|---|---|
| 1 | POWER does not light its LED even if it is turned on. | 1. A power failure occurs.<br>2. The power cord is disconnected. | 1. Wait until power is restored.<br>2. Contact Thermo Fisher Scientific service. |
| 2 | The cell washer does not start operation. | 1. The door is not closed.<br>2. The door switch is defective. | 1. Close the door.<br>2. Contact Thermo Fisher Scientific service. |
| 3 | Injection of saline does not take place. | 1. No saline is in the tank.<br>2. The pump is not filled with saline.<br>3. The pump is defective.<br>4. The pump connector is loose. | 1. / 2. For the the first two possible causes: refill the tank with saline to fill the pump.<br>3. Contact Thermo Fisher Scientific service.<br>4. Retighten it securely. |
| 4 | Saline (waste liquid) scatters in the chamber.<br>1. The amount of blood cells after washing is less than before.<br>2. No washing is executed.<br>3. Washing is executed. | 1. Injection volume is excessive and the test tubes are overflown with solution.<br>2. The nozzle is out of position and fails to supply the distributor with solution.<br>3. The drain cover is broken. | 1. Adjust the injection volume correctly.<br>2. / 3. Contact Thermo Fisher Scientific service. |
| 5 | No decantation is executed. | The coil is disconnected. | Contact Thermo Fisher Scientific service. |
| 6 | Abnormal noise is heard.<br>1. Contacting noise<br>2. Others | 1. The bowl and the rotor contact the drain cover.<br>2. The bearing and the locking screw for the decantation coil are defective. | 1. Set the bowl and the rotor correctly.<br>2. Contact Thermo Fisher Scientific service. |
| 7 | The cell washer intensely vibrates. | 1. Imbalance operation.<br>2. The bowl, rotor and distributor are not set correctly.<br>3. The center packing is not mounted correctly.<br>4. Others. | 1. Balance correctly.<br>2. Set the bowl, rotor and distributor correctly.<br>3. Mount the center packing correctly.<br>4. Contact Thermo Fisher Scientific service. |
| 8 | A test tube breaks. | 1. The test tube is not strong.<br>2. The test tube is different in size.<br>3. The rotor holder is deformed. | 1. Use test tubes strong enough to bear the centrifugal force.<br>2. Use applicable-sized test tubes.<br>3. Contact Thermo Fisher Scientific service. |
| 9 | Hemolysis is found in the blood cells. | 1. Density of saline is improper.<br>2. Sample is contaminated by bacteria.<br>3. Fragments of a test tube are mixed. | 1. Exchange for saline of proper density (0.9%).<br>2. Clean the tank, tube and pump (especially the inside of the tank).<br>3. Remove glass fragments in the chamber and the drain cover. |

# Decontamination Information Certificate

## INSTRUCTIONS

When an instrument used with radioactive, pathogenic, or otherwise hazardous materials requires servicing by Thermo Fisher Scientific personnel either at the customer's laboratory or at Thermo Fisher Scientific facilities, the following procedure must be complied with to insure safety of our personnel:

1. The instrument or part to be serviced shall be cleaned of all blood and other encrusted material and decontaminated prior to servicing by our representative.

   No radioactivity shall be detectable by survey equipment.

2. A Decontamination Information Certificate shall be completed and attached to the instrument or part.

If an instrument or part to be serviced does not have a Decontamination Information Certificate attached to it, and, in our opinion, presents a potential radioactive or biological hazard, our representative will not service the equipment until proper decontamination and certification has been completed.

If an instrument is received at our service facilities and, in our opinion, poses a radioactive or biological hazard, the sender will be contacted for instructions as the equipment is to be disposed. Disposition costs will be borne by the sender.

Additional certificates are available from your local technical or customer service representative. In the event these certificates are not available, a written statement certifying that the instrument or part has been correctly decontaminated and outlining the procedures used will be acceptable.

**NOTE** *Thermo Fisher Scientific Service representatives will indicate on a Customer Service Repair Report if decontamination was required, and if so, what the contaminate was and what procedure was used. If no decontamination was required, it should be stated.*

## Decontamination Information Certificate

Complete and attach to equipment BEFORE servicing.

DECONTAMINATION

CERTIFIED BY _____ TITLE/POSITION _____

PHONE _____ FAX _____ DEPARTMENT _____

INSTITUTION ADDRESS _____

CITY _____ STATE _____ ZIP _____

INSTRUMENT _____ SERIAL NUMBER _____

ROTOR _____ SERIAL NUMBER _____

PART _____ PART NUMBER _____

HAZARDOUS CONTAMINANT(S) _____ DECONTAMINATION DATE _____

DECONTAMINATION METHOD(S) _____

DECONTAMINATION _____

CERTIFIER'S SIGNATURE: _____ DATE: _____

# Chemical Compatibility

| 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™, Clear Crimp™ | Polyallomer | Polycarbonate | Polyester, Glass Thermoset | Polythermide | 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 | / | M | S | / | / | S | / | / |
| Aluminum Chloride | U | U | S | S | S | S | U | S | S | S | S | M | S | S | S | S | / | S | S | S | S | S | M | U | U | S | S |
| Formic Acid (100%) | / | S | M | U | / | / | U | / | / | / | / | U | / | S | M | U | U | S | S | / | U | S | / | U | S | / | U |
| Ammonium Acetate | S | S | U | / | S | S | S | / | S | S | S | S | S | S | S | U | / | S | S | S | S | S | S | S | S | S | S |
| Ammonium Carbonate | M | S | U | S | S | S | S | S | S | S | S | S | S | S | U | U | / | S | S | S | S | S | S | M | S | S | S |
| Ammonium Hydroxide (10%) | U | U | S | U | S | S | M | S | S | S | S | S | / | S | U | M | S | S | S | S | S | S | S | S | S | M | S |
| Ammonium Hydroxide (28%) | U | U | S | U | S | U | M | S | S | S | S | S | U | S | U | M | S | S | S | S | S | S | S | S | S | M | S |
| Ammonium Hydroxide (conc.) | U | U | U | U | S | U | M | S | / | S | / | S | U | S | U | U | S | S | S | / | M | S | S | S | S | / | U |
| Ammonium Phosphate | U | / | S | / | S | S | S | S | S | S | S | S | / | S | S | M | / | S | S | S | S | S | S | M | S | S | S |
| Ammonium Sulfate | U | M | S | / | S | S | U | S | S | S | S | S | S | S | S | S | / | S | S | S | S | S | S | U | S | S | U |
| Amyl Alcohol | S | / | M | U | / | / | S | S | / | M | / | S | / | M | S | S | S | S | M | / | / | / | U | / | S | / | M |
| Aniline | S | S | U | U | S | U | S | M | S | U | U | U | U | U | U | U | / | S | M | U | U | S | S | S | S | U | S |
| Sodium Hydroxide (<1%) | U | / | M | S | S | S | / | / | S | M | S | S | / | S | M | M | S | S | S | S | S | S | M | S | S | / | U |
| Sodium Hydroxide (10%) | U | / | M | U | / | / | U | / | M | M | S | S | U | S | U | U | S | S | S | S | S | S | M | S | S | / | U |
| Barium Salts | M | U | S | / | S | S | S | S | S | S | S | S | S | S | S | M | / | S | S | S | S | S | S | M | S | S | S |
| Benzene | S | S | U | U | S | U | M | U | S | U | U | S | U | U | U | M | U | M | U | U | U | S | U | U | S | U | S |
| Benzyl Alcohol | S | / | U | U | / | / | M | M | / | M | / | S | U | U | U | U | U | U | U | / | M | S | M | / | S | / | S |
| Boric Acid | U | S | S | M | S | S | U | S | S | S | S | S | S | S | S | S | U | S | S | S | S | S | S | S | S | S | S |
| Cesium Acetate | M | / | S | / | S | S | S | / | S | S | S | S | / | S | S | / | / | S | S | S | S | S | S | M | S | S | S |
| 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 |
| Diethylpyro-carbonate | S | S | U | / | S | S | S | / | S | S | U | S | U | S | U | / | / | S | S | S | M | S | S | S | S | S | S |
| Dimethylsulfoxide | S | S | U | U | S | S | S | / | S | U | S | S | U | S | U | U | / | S | S | U | U | S | S | S | S | U | U |
| Dioxane | M | S | U | U | S | S | M | M | S | U | U | S | U | M | U | U | / | M | M | M | U | S | S | S | S | U | U |
| Ferric Chloride | U | U | S | / | / | / | M | S | / | M | / | S | / | S | / | / | / | S | S | / | / | / | M | U | S | / | S |
| Acetic Acid (Glacial) | S | S | U | U | S | S | U | M | S | U | S | U | U | U | U | U | M | S | U | M | U | S | U | U | S | / | U |
| Acetic Acid (5%) | S | S | M | S | S | S | M | S | S | S | S | S | M | S | S | S | S | S | S | S | M | S | S | M | S | S | M |
| Acetic Acid (60%) | S | S | U | U | S | S | U | / | S | M | S | U | U | M | U | S | M | S | M | S | M | S | M | U | S | M | U |
| Ethyl Acetate | M | M | U | U | S | S | M | M | S | S | U | S | U | M | U | U | / | S | S | U | U | S | M | M | S | U | U |
| Ethyl Alcohol (50%) | S | S | S | S | S | S | M | S | S | S | S | S | U | S | U | S | S | S | S | S | S | S | S | M | S | M | U |
| Ethyl Alcohol (95%) | S | S | S | U | S | S | M | S | S | S | S | S | U | S | U | / | S | S | S | M | S | S | S | U | S | M | U |
| Ethylene Dichloride | S | / | U | U | / | / | S | M | / | U | U | S | U | U | U | U | U | U | U | / | U | S | U | / | S | / | S |
| Ethylene Glycol | S | S | S | S | S | S | S | S | S | S | S | S | / | S | U | S | S | S | S | S | S | S | S | M | S | M | S |
| Ethylene Oxide Vapor | S | / | U | / | / | U | / | / | S | U | / | S | / | S | M | / | / | S | S | S | U | S | U | S | S | S | U |
| Ficoll-Hypaque™ | M | S | S | / | S | S | S | / | S | S | S | S | / | S | S | / | S | S | S | S | S | S | S | M | S | S | S |

| 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™, Clear Crimp™ | Polyallomer | Polycarbonate | Polyester, Glass Thermoset | Polyetherimide | Polyethylene | Polypropylene | Polysulfone | Polyvinyl Chloride | Rulon A™, Teflon™ | Silicone Rubber | Stainless Steel | Titanium | Tygon™ | Viton™ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hydrofluoric Acid (10%) | U | U | U | M | / | / | U | / | / | U | U | S | / | S | M | U | S | S | S | S | M | S | U | U | U | / | / |
| Hydrofluoric Acid (50%) | U | U | U | U | / | / | U | / | / | U | U | U | U | S | U | U | U | S | S | M | M | S | U | U | U | / | M |
| Hydrochloric Acid (conc.) | U | U | U | U | / | U | U | M | / | U | M | U | U | M | U | U | U | / | S | / | U | S | U | U | U | / | / |
| Formaldehyde (40%) | M | M | M | S | S | S | S | M | S | S | S | S | M | S | S | S | U | S | S | M | S | S | S | M | S | M | U |
| Glutaraldehyde | S | S | S | S | / | / | S | / | S | S | S | S | S | S | S | / | / | S | S | S | / | / | S | S | S | / | / |
| Glycerol | M | S | S | / | S | S | S | S | S | S | S | S | S | S | S | S | / | S | S | S | S | S | S | S | S | S | S |
| Guanidine Hydrochloride | U | U | S | / | S | S | S | / | S | S | S | S | S | S | S | / | / | S | S | S | S | S | S | U | S | S | S |
| Haemo-Sol™ | S | S | S | / | / | / | S | / | S | S | S | S | S | S | S | / | / | S | S | S | S | S | S | S | S | S | S |
| Hexane | S | S | S | / | S | S | S | / | S | S | U | S | U | M | U | S | S | U | S | S | M | S | U | S | S | U | S |
| Isobutyl Alcohol | / | / | M | U | / | / | S | S | / | U | / | S | U | S | S | M | S | S | S | / | S | S | S | / | S | / | S |
| Isopropyl Alcohol | M | M | M | U | S | S | S | S | S | U | S | S | U | S | U | M | S | S | S | S | S | S | S | M | M | M | S |
| Iodoacetic Acid | S | S | M | / | S | S | S | / | S | M | S | S | M | S | S | / | M | S | S | S | S | S | M | S | S | M | M |
| Potassium Bromide | U | S | S | / | S | S | S | / | S | S | S | S | S | S | S | S | S | S | S | / | S | S | S | M | S | S | S |
| Potassium Carbonate | M | U | S | S | S | S | S | / | S | S | S | S | S | S | U | S | S | S | S | S | S | S | S | S | S | S | S |
| Potassium Chloride | U | S | S | / | S | S | S | S | S | S | S | S | S | S | S | / | S | S | S | S | S | S | S | U | S | S | S |
| Potassium Hydroxide (5%) | U | U | S | S | S | S | M | / | S | S | S | S | / | S | U | S | S | S | S | S | S | S | M | U | M | S | U |
| Potassium Hydroxide (conc.) | U | U | M | U | / | / | M | / | M | S | S | / | U | M | U | U | U | S | M | / | M | U | / | U | U | / | U |
| Potassium Permanganate | S | S | S | / | S | S | S | / | S | S | S | U | S | S | S | M | / | S | M | S | U | S | S | M | S | U | S |
| Calcium Chloride | M | U | S | S | S | S | S | S | S | S | S | S | S | S | M | S | / | S | S | S | S | S | S | M | S | S | S |
| Calcium Hypochlorite | M | / | U | / | S | M | M | S | / | M | / | S | / | S | M | S | / | S | S | S | M | S | M | U | S | / | S |
| Kerosene | S | S | S | / | S | S | S | U | S | M | U | S | U | M | M | S | / | M | M | M | S | S | U | S | S | U | S |
| Sodium Chloride (10%) | S | / | S | S | S | S | S | S | / | / | / | S | S | S | S | S | / | S | S | S | S | / | S | S | M | / | S |
| Sodium Chloride (sat'd) | U | / | S | U | S | S | S | / | / | / | / | S | S | S | S | S | / | S | S | / | S | / | S | S | M | / | S |
| Carbon Tetrachloride | U | U | M | S | S | U | M | U | S | U | U | S | U | M | U | S | S | M | M | S | M | M | M | M | U | S | S |
| Aqua Regia | U | / | U | U | / | / | U | / | / | / | / | / | U | U | U | U | U | U | U | / | / | / | / | / | S | / | M |
| Solution 555 (20%) | S | S | S | / | / | / | S | / | S | S | S | S | S | S | S | / | / | S | S | S | / | S | S | S | S | S | S |
| Magnesium Chloride | M | S | S | / | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | M | S | S | S |
| Mercaptoacetic Acid | U | S | U | / | S | M | S | / | S | M | S | U | U | U | U | / | S | U | U | S | M | S | U | S | S | S | S |
| Methyl Alcohol | S | S | S | U | S | S | M | S | S | S | S | S | U | S | U | M | S | S | S | S | S | S | S | M | S | M | U |
| Methylene Chloride | U | U | U | U | M | S | S | U | S | U | U | S | U | U | U | U | U | M | U | U | U | S | S | M | U | S | U |
| Methyl Ethyl Ketone | S | S | U | U | S | S | M | S | S | U | U | S | U | S | U | U | U | S | S | U | U | S | S | S | S | U | U |
| Metrizamide™ | M | S | S | / | S | S | S | / | S | S | S | S | / | S | S | / | / | S | S | S | S | S | S | M | S | S | S |
| Lactic Acid (100%) | / | / | S | / | / | / | / | / | / | M | S | U | / | S | S | S | M | S | S | / | M | S | M | S | S | / | S |
| Lactic Acid (20%) | / | / | S | S | / | / | / | / | / | M | S | M | / | S | S | S | S | S | S | S | M | S | M | S | S | / | S |
| N/Butyl Alcohol | S | / | S | U | / | / | S | / | / | S | M | / | U | S | M | S | S | S | S | M | M | S | M | / | S | / | S |
| N/Butyl Phthalate | S | S | U | / | S | S | S | / | S | U | U | S | U | U | U | M | / | U | U | S | U | S | M | M | S | U | S |
| N, N-Dimethylformamide | S | S | S | U | S | M | S | / | S | S | U | S | U | S | U | U | / | S | S | U | U | S | M | S | S | S | U |
| Sodium Borate | M | S | S | S | S | S | S | S | S | S | S | U | S | S | S | S | / | S | S | S | S | S | S | M | S | S | S |
| Sodium Bromide | U | S | S | / | S | S | S | / | S | S | S | S | S | S | S | S | / | S | S | S | S | S | S | M | S | S | S |
| Sodium Carbonate (2%) | M | U | S | S | S | S | S | S | S | S | S | S | S | S | U | S | S | S | S | S | S | S | S | S | S | S | S |
| Sodium Dodecyl Sulfate | S | S | S | / | S | S | S | / | S | S | S | S | S | S | S | / | S | S | S | S | S | S | S | S | S | S | S |
| Sodium Hypochlorite (5%) | U | U | M | S | S | M | U | S | S | M | S | S | S | M | S | S | S | S | M | S | S | S | M | U | S | M | S |
| Sodium Iodide | M | S | S | / | S | S | S | / | S | S | S | S | S | S | S | / | / | S | S | S | S | S | S | M | S | S | S |
| Sodium Nitrate | S | S | S | / | S | S | S | S | S | S | S | S | S | S | S | S | / | S | S | S | S | S | U | S | S | S | S |
| Sodium Sulfate | U | S | S | / | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | M | S | S | S |
| Sodium Sulfide | S | / | S | S | / | / | / | S | / | / | / | S | S | S | U | U | / | / | S | / | / | / | S | S | M | / | S |
| Sodium Sulfite | S | S | S | / | S | S | S | S | M | S | S | S | S | S | S | M | / | S | S | S | S | S | S | S | S | S | S |
| Nickel Salts | U | S | S | S | S | S | / | S | S | S | / | / | S | S | S | S | / | S | S | S | S | S | S | M | S | S | S |
| Oils (Petroleum) | S | S | S | / | / | / | S | U | S | S | S | S | U | U | M | S | M | U | U | S | S | S | U | S | S | S | S |
| Oils (Other) | S | / | S | / | / | / | S | M | S | S | S | S | U | S | S | S | S | U | S | S | S | S | / | S | S | M | S |
| Oleic Acid | S | / | U | S | S | S | U | U | S | U | S | S | M | S | S | S | S | S | S | S | S | S | M | U | S | M | M |
| Oxalic Acid | U | U | M | S | S | S | U | S | S | S | S | S | U | S | U | S | S | S | S | S | S | S | S | U | M | S | S |
| Perchloric Acid (10%) | U | / | U | / | S | U | U | / | S | M | M | / | / | M | U | M | S | M | M | / | M | S | U | / | S | / | S |
| Perchloric Acid (70%) | U | U | U | / | / | U | U | / | S | U | M | U | U | M | U | U | U | M | M | U | M | S | U | U | S | U | S |
| Phenol (5%) | U | S | U | / | S | M | M | / | S | U | M | U | U | S | U | M | S | M | S | U | U | S | U | M | M | M | S |
| Phenol (50%) | U | S | U | / | S | U | M | / | S | U | M | U | U | U | U | U | S | U | M | U | U | S | U | U | U | M | S |

| CHEMICAL / MATERIAL | Aluminum | Anodic Coating for Aluminum | Buna N | Cellulose Acetate Butyrate | Polyurethane Rotor Paint | Composite Carbon Fiber/Epoxy | Delrin™ | Ethylene Propylene | Glass | Neoprene | Noryl™ | Nylon | PET[1], Polyclear™, Clear Crimp™ | Polyallomer | Polycarbonate | Polyester, Glass Thermoset | Polyetherimide | Polyethylene | Polypropylene | Polysulfone | Polyvinyl Chloride | Rulon A™, Teflon™ | Silicone Rubber | Stainless Steel | Titanium | Tygon™ | Viton™ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phosphoric Acid (10%) | U | U | M | S | S | S | U | S | S | S | S | U | / | S | S | S | S | S | S | S | S | S | U | M | U | S | S |
| Phosphoric Acid (conc.) | U | U | M | M | / | / | U | S | / | M | S | U | U | M | M | S | S | S | M | S | M | S | U | M | U | / | S |
| Physiologic Media (Serum, Urine) | M | S | S | S | / | / | S | / | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Picric Acid | S | S | U | / | S | M | S | S | S | M | S | U | S | S | S | U | S | S | S | S | U | S | U | M | S | M | S |
| Pyridine (50%) | U | S | U | U | S | U | U | / | U | S | S | U | U | M | U | U | / | U | S | M | U | S | S | U | U | U | U |
| Rubidium Bromide | M | S | S | / | S | S | S | / | S | S | S | S | S | S | S | / | / | S | S | S | S | S | S | M | S | S | S |
| Rubidium Chloride | M | S | S | / | S | S | S | / | S | S | S | S | S | S | S | / | / | S | S | S | S | S | S | M | S | S | S |
| Sucrose | M | S | S | / | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Sucrose, Alkaline | M | S | S | / | S | S | S | / | S | S | S | S | S | S | U | S | S | S | S | S | S | S | S | M | S | S | S |
| Sulfosalicylic Acid | U | U | S | S | S | S | S | / | S | S | S | U | S | S | S | / | S | S | S | / | S | S | S | U | S | S | S |
| Nitric Acid (10%) | U | S | U | S | S | U | U | / | S | U | S | U | / | S | S | S | S | S | S | S | S | S | M | S | S | S | S |
| Nitric Acid (50%) | U | S | U | M | S | U | U | / | S | U | S | U | U | M | M | U | M | M | M | S | S | S | U | S | S | M | S |
| Nitric Acid (95%) | U | / | U | U | / | U | U | / | / | U | U | U | U | M | U | U | U | U | M | U | U | S | U | S | S | / | S |
| Hydrochloric Acid (10%) | U | U | M | S | S | S | U | / | S | S | S | U | U | S | U | S | S | S | S | S | S | S | S | U | M | S | S |
| Hydrochloric Acid (50%) | U | U | U | U | S | U | U | / | S | M | S | U | U | M | U | U | S | S | S | S | M | S | M | U | U | M | M |
| Sulfuric Acid (10%) | M | U | U | S | S | U | U | / | S | S | M | U | S | S | S | S | S | S | S | S | S | S | U | U | U | S | S |
| Sulfuric Acid (50%) | M | U | U | U | S | U | U | / | S | S | M | U | U | S | U | U | M | S | S | S | S | S | U | U | U | M | S |
| Sulfuric Acid (conc.) | M | U | U | U | / | U | U | M | / | / | M | U | U | S | U | U | U | M | S | U | M | S | U | U | U | / | S |
| Stearic Acid | S | / | S | / | / | / | S | M | S | S | S | S | / | S | S | S | S | S | S | S | S | S | M | M | S | S | S |
| Tetrahydrofuran | S | S | U | U | S | U | U | M | S | U | U | S | U | U | U | / | M | U | U | U | U | S | U | S | S | U | U |
| Toluene | S | S | U | U | S | S | M | U | S | U | U | S | U | U | U | S | U | M | U | U | U | S | U | S | U | U | M |
| Trichloroacetic Acid | U | U | U | / | S | S | U | M | S | U | S | U | U | S | M | / | M | S | S | U | U | S | U | U | U | M | U |
| Trichloroethane | S | / | U | / | / | / | M | U | / | U | / | S | U | U | U | U | U | U | U | U | U | S | U | / | S | / | S |
| Trichloroethylene | / | / | U | U | / | / | / | U | / | U | / | S | U | U | U | U | U | U | U | U | U | S | U | / | U | / | S |
| Trisodium Phosphate | / | / | / | S | / | / | M | / | / | / | / | / | / | S | / | / | S | S | S | / | / | S | / | / | S | / | S |
| Tris Buffer (neutral pH) | U | S | S | S | S | S | S | / | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Triton X/100™ | S | S | S | / | S | S | S | / | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Urea | S | / | U | S | S | S | S | / | / | / | / | S | S | S | M | S | S | S | S | / | S | S | S | M | S | / | S |
| Hydrogen Peroxide (10%) | U | U | M | S | S | U | U | / | S | S | S | U | S | S | S | M | U | S | S | S | S | S | S | M | S | U | S |
| Hydrogen Peroxide (3%) | S | M | S | S | S | / | S | / | S | S | S | S | S | S | S | S | M | S | S | S | S | S | S | S | S | S | S |
| Xylene | S | S | U | S | S | S | M | U | S | U | U | U | U | U | U | M | U | M | U | U | U | S | U | M | S | U | S |
| Zinc Chloride | U | U | S | S | S | S | U | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | U | S | S | S |
| Zinc Sulfate | U | S | S | / | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Citric Acid (10%) | M | S | S | M | S | S | M | S | S | S | S | S | S | S | S | S | M | S | S | S | S | S | S | S | S | S | S |

[1] Polyethlyeneterephtalate

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.

## NOTICE

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

# Index

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