

Thermo Scientific Sorvall Legend X1 / X1R Centrifuge

Instruction Manual

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WEEE Conformity

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



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Preface

Before starting to use the centrifuge, read through this instruction manual carefully and follow the instructions.

The information contained in this instruction manual is the property of Thermo Fisher Scientific; it is forbidden to copy or pass on this information without explicit approval.

Failure to follow the instructions and safety information in this instruction manual will result in the expiration of the sellers warranty.

Scope of supply

Article number		Quantity	Check
	Sorvall Legend X1 / X1R Centrifuge	1	<input type="checkbox"/>
	Power supply cable	1	<input type="checkbox"/>
50120979	Instruction manual	1	<input type="checkbox"/>
50122054	CD with manual	1	<input type="checkbox"/>

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



This symbol refers to general hazards.

CAUTION means that material damage could occur.

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



This symbol refers to biological hazards.

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

Intended use

- This centrifuge is an IVD accessory, and therefore subject to the Directive 98/79/EC of the European Parliament and the Council of October 27, 1998 on in vitro diagnostic medical devices.
- This centrifuge is a laboratory product designed to separate components by generation of Relative Centrifugal Force. It separates human samples (e.g. blood, urine and other body fluids) collected in appropriate containers, either alone or after addition of reagents or other additives.
- As general-purpose centrifuge, it is designed to also run other containers filled with chemicals, environmental samples and other non-human body samples.
- Maximum sample density at maximum speed: $1.2 \frac{g}{cm^3}$
- This centrifuge should be operated by trained specialists only.

Accident prevention



WARNING Plug the centrifuge only into sockets which have been properly grounded.



WARNING If a hazardous situation occurs, turn off the power supply to the centrifuge and leave the area immediately.

Prerequisite for the safe operation of the Sorvall Legend X1 / X1R is a work environment in compliance with standards, directives and trade association safety regulations and proper instruction of the user.

The safety regulations contain the following basic recommendations:

- Maintain a radius of at least 30 cm around the centrifuge.
- Implementation of special measures which ensure that no one can approach the centrifuge for longer than absolutely necessary while it is running.

The mains plug must be freely accessible at all times. Pull out the power supply plug or disconnect the power supply in an emergency.



Precautions

In order to ensure safe operation of the Sorvall Legend X1 / X1R, the following general safety regulations must be followed:

- The centrifuge should be operated by trained specialists only.
- The centrifuge is to be used for its intended use only.
- Do not move the centrifuge while it is running.
- Do not lean on the centrifuge.
- Use only rotors and accessories for this centrifuge which have been approved by Thermo Fisher Scientific. Exceptions to this rule are commercially available glass or plastic centrifuge tubes, provided they have been approved for the speed or the RCF value of the rotor.
- Do not use rotors which show any signs of corrosion and/or cracks.
- Do not touch the mechanical components of the rotor and do not make any changes to the mechanical components.
- Use only with rotors which have been properly installed. Follow the instructions on the Autolock in section “[Rotor installation](#)” on [page 4-2](#).
- Use only with rotors which have been loaded properly. Follow the instructions given in the rotor manual.
- Never overload the rotor. Follow the instructions given in the rotor manual.
- Never start the centrifuge when the lid is open.
- Never open the lid until the rotor has come to a complete stop and this has been confirmed in the display.
- The lid emergency release may be used in emergencies only to recover the samples from the centrifuge, e.g. during a power failure (see section “[Mechanical emergency lid release](#)” on [page 7-2](#)).
- Never use the centrifuge if parts of its cover panels are damaged or missing.
- Do not touch the electronic components of the centrifuge or alter any electronic or mechanical components.
- Please observe the safety instructions.



Please pay particular attention to the following aspects:

- Location: well-ventilated environment, set-up on a level and rigid surface with adequate load-bearing capacity.
- Rotor installation: Make sure the rotor is locked properly into place before operating the centrifuge.



- Especially when working with corrosive samples (salt solutions, acids, bases), the accessory parts and vessel have to be cleaned carefully.
- Always balance the samples.

Centrifuging hazardous substances:

- Do not centrifuge explosive or flammable materials or substances which could react violently with one another.
- The centrifuge is neither inert nor protected against explosion. Never use the centrifuge in an explosion-prone environment.
- Do not centrifuge inflammable substances.

Remaining risk: Improper use can cause damages, contamination, and injuries with fatal consequences.

- Do not centrifuge toxic or radioactive materials or any pathogenic micro-organisms without suitable safety precautions.

When centrifuging microbiological samples from the Risk Group II (according to the Bio-safety Manual" of the World Health Organization (WHO)), aerosol-tight biological seals have to be used.

For materials in a higher risk group, extra safety measures have to be taken.

- If toxins or pathogenic substances have gotten into the centrifuge or its parts, appropriate disinfection measures have to be taken (see “Disinfection” on page 6-4).

Remaining risk: Improper use can cause damages, contamination, and injuries with fatal consequences.

- Highly corrosive substances which can cause material damage and impair the mechanical stability of the rotor, should only be centrifuged in corresponding protective tubes.



Introduction and description

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Characteristics of the Thermo Scientific Sorvall Legend X1/ X 1R


The Sorvall Legend X1/ X1R is an in-vitro diagnostics device according to the In-Vitro Diagnostics Directive 98/79/EC.

Several rotors with a wide range of tubes can be used.

The set speed is reached within seconds. The maintenance-free induction motor ensures quiet and low-vibration operation even at high speeds, and guarantees a very long lifetime.

The user-friendly control panel makes it easy to pre-set the speed, RCF value, run time, temperature, and run profile (acceleration and braking curves). You can choose between the display of speed and RCF or the entry mode.

These settings can be changed even while the centrifuge is running.

With the help of the  key, you can also centrifuge a sample for just a few seconds, if called for.

The Sorvall Legend X1 / X1R is equipped with various safety features:

- The housing and rotor chamber consist of steel plate, the interior of armour steel, while the front panel is made of high-impact resistant plastic.
- The lid is equipped with a view port and a lock.
- The lid of the centrifuge can only be opened while the centrifuge is switched on and the rotor has come to a complete stop. The centrifuge cannot be started until the lid has been closed properly.
- The integrated rotor detection systems ensures that no inadmissible speed settings can be preselected.
- Electronic imbalance recognition
- Lid emergency release: For emergencies only, e.g. during power failures (see [“Mechanical emergency lid release”](#) on page 7-2)

Technical data

The technical data of the Sorvall Legend X1 / X1R is listed in the following table.

Table 1-1. Technical Data Sorvall Legend X1 / X1R

Feature	Sorvall Legend X1R		Sorvall Legend X1	
Environmental conditions	-Use in interior spaces -Altitudes of up to 2,000 m above sea level -max. relative humidity 80 % up to 31 °C; decreasing linearly up to 50 % relative humidity at 40 °C.			
Permissible ambient temperature	+2 °C to +35 °C		+2 °C to +35 °C	
Overvoltage category	II		II	
Pollution degree	2		2	
Voltage	230 V	120 V	230 V	120 V
Heat dissipation	4778 BTU/h	4096 BTU/h	3447 BTU/h	3901 BTU/h
IP	20		20	
Run time	unlimited		unlimited	
Max speed n_{\max}	15200 rpm (depending on the rotor)		15200 rpm (depending on the rotor)	
Min speed n_{\min}	300 rpm		300 rpm	
Maximum RCF value at n_{\max}	25830 x g		25830 x g	
Maximum kinetic energy	62.5 kJ		51.7 kJ	
Noise level at maximum speed	< 63 dB (A)		< 63 dB (A)	
Temperature setting range	-10 °C to +40 °C			
Dimensions	refrigerated		ventilated	
Height	360 mm		360 mm	
Height with lid open	870 mm		870 mm	
Width	623 mm		440 mm	
Depth	605 mm		605 mm	
Table top height	310 mm		310 mm	
Weight without rotor	91.5 kg		57.5 kg	

Directives, standards and guidelines

Table 1-2. Directives, standards and guidelines

Tension / frequency		Produced and inspected according to the following standards and guidelines
230 V 50 / 60 Hz	2006/95/EC Low Voltage Directive: 2006/42/EC & 98/37/EC Machine Directive: 2004/108/EC EMC Directive 98/79/EC In-vitro-Diagnostika (IvD)	EN 61010-1, 2 nd Edition EN 61010-2-020, 2 nd Edition EN 61010-2-101 EN 61326-1 EN 61326-2-6 EN 55011B EN 61000-6-2 EN ISO 13485
230 V, 60 Hz 120 V, 60 Hz 100 V, 60 Hz		UL 61010-1, 2 nd Edition CAN/CSA-C22.2 No. 61010-1, 2 nd Edition IEC 61010-2-20, 2 nd Edition Pollution degree 2, Overvoltage category II) IEC 61010-2-101 Emitted interference FCC Part 15 CLASS A NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
100 V 50 Hz		IEC 61010-1 2 nd Edition IEC 61010-2-020 2 nd Edition IEC 61010-2-101 EN 61326-1 EN 61326-2-6 EN 55011A EN 61000-6-2 EN ISO 13485

Functions and features

The following table gives an overview of the important functional and performance characteristics of the Sorvall Legend X1 / X1R.

Table 1-3. Functions and Features

Component / function	Description / features
Structure / Housing	Galvanized steel chassis with armoured plating
Chamber	Stainless steel
Drive	Induction drive without carbon brushes
Keys and display	Easy-to-clean keypad and display surface
Controls	Microprocessor-controlled
Internal memory	The most recent data is saved
Functions	RCF-selection, temperature control, pretemp with cooling equipped devices
Acceleration / braking profiles	9 acceleration and 10 braking curves
Rotor recognition	Automatic
Imbalance recognition	Electronic, contingent on rotor and speed
Lid lock	Automatic lid closing and locking starting from an initial hold position

Mains supply

The following table contains an overview of the electrical connection data for the Sorvall Legend X1 / X1R. This data is to be taken into consideration when selecting the mains connection socket.

Table 1-4. Electrical connection data of the Sorvall Legend X1 / X1R

Cat.		Mains voltage	Frequency	Rated current	Power consumption	Equipment fuse	Building fuse
75004260	refrigerated	230 V ±10 %	50 / 60 Hz	8 A	1400 W	15 AT	16 AT
75004261	refrigerated	120 V ±10 %	60 Hz	12 A	1200 W	15 AT	15 AT
75004263	refrigerated	100 V ±10 %	50 / 60 Hz ¹	12.5 A	1000 W	15 AT	15 AT
75004220	ventilated	230 V ±10 %	50 / 60 Hz	6 A	1010 W	15 AT	16 AT
75004221	ventilated	120 V ±10 %	60 Hz	9.5 A	850 W	15 AT	15 AT
75004223	ventilated	100 V ±10 %	50 / 60 Hz	9.5 A	750 W	15 AT	15 AT

¹ Please contact the Thermo Fisher service to run the unit at 60Hz Line frequency.

Rotor selection

The Sorvall Legend X1 / X1R of the is supplied without a rotor.

Various Thermo Scientific rotors are available to choose from.

TX-400	75003629
with round buckets	75003655
TX-200	75003658
with round buckets	75003659
BIOShield™ 720	75003621
M-20	75003624
Microliter 30x2 sealed	75003652
CLINIConic™ 30x15	75003623
8x50 sealed	75003694
Fiberlite® F15-6 x 100	75003698
Fiberlite F13-14 x 50c	75003661
Fiberlite F15-8 x 50c	75003663
Fiberlite F21-48 x 2	75003664
Microliter 48 x 2 sealed	75003602
HIGHConic™ II	75003620

The technical data of the rotors and the corresponding adapters and reduction sleeves for various commercially available containers can be found in the corresponding rotor operating manuals.

For more information visit our website at: <http://www.thermofisher.com/centrifuge>

Before use

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- “Storage” on page 2-4

Before setting up

1. Check the centrifuge 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 the order for completeness (see “[Scope of supply](#)” on [page iii](#)).
If the order is incomplete, please contact Thermo Fisher Scientific.

Transporting the centrifuge

- Due to its weight (see “[Technical data](#)” on [page 1-3](#)), the centrifuge should be carried by several people.
- Always lift the centrifuge at both sides.

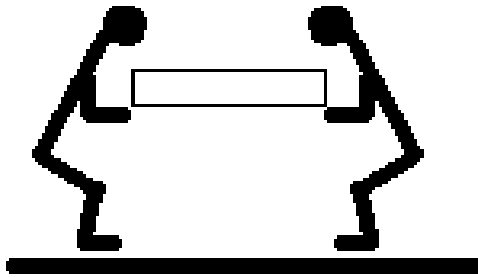


Figure 2-1. Lifting the centrifuge at both sides.

- The centrifuge can be damaged by impacts.
- Transport the centrifuge upright and if at all possible in its packaging.



WARNING Always lift the centrifuge on both sides. Never lift the centrifuge by its front or the back panel.
Always remove the rotor before moving the centrifuge.

Location

The centrifuge should only be operated indoors.

The set-up location must fulfill the following requirements:

- A safety zone of at least 30 cm must be maintained around the centrifuge.
People and hazardous substances must be kept out of the safety zone while centrifuging.
- The supporting structure must be stable and free of resonance, for example a level laboratory bench.
- The supporting structure must be suitable for horizontal setup of the centrifuge.

- The centrifuge should not be exposed to heat and strong sunlight.



WARNING UV rays reduce the stability of plastics.
Do not subject the centrifuge, rotors and plastic accessories to direct sunlight.

- The set-up location must be well-ventilated at all times.

Aligning the centrifuge

The horizontal alignment of the centrifuge must be checked every time after moving it to a different location.

The supporting structure must be suitable for horizontal setup of the centrifuge.



CAUTION If the centrifuge isn't level, imbalances can occur and the centrifuge can be damaged.
Do not place anything under the feet to level the centrifuge.

Mains Connection

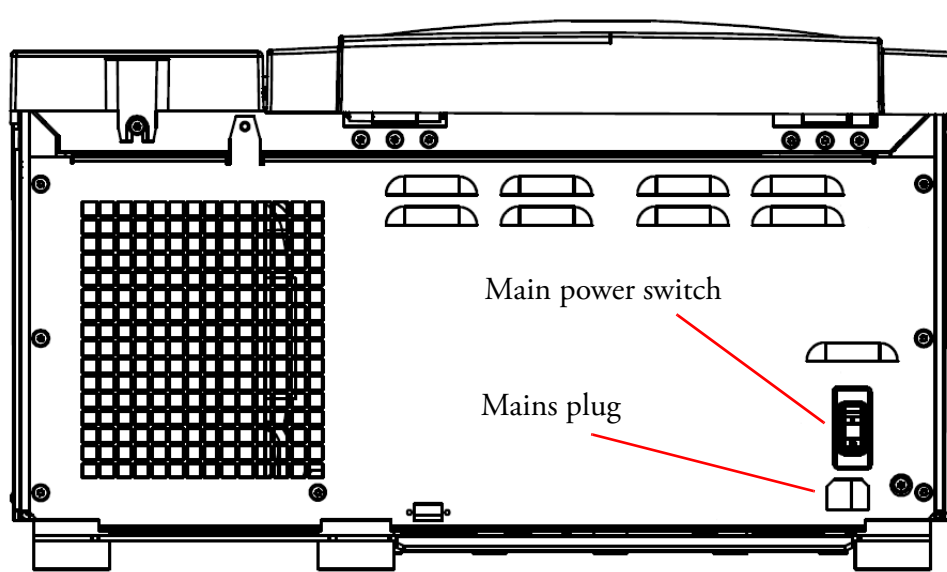


Figure 2-2. Mains connection

1. Turn off the power supply switch on the back (press "0").
2. Plug the centrifuge into grounded electrical sockets only.
3. Check whether the cable complies with the safety standards of your country.
4. Make sure that the voltage and frequency correspond to the figures on the rating plate.
5. Establish the connection to the power supply with the connecting cable.

Storage

- Before storing the centrifuge and the accessories it must be cleaned and if necessary disinfected and decontaminated.
- Store the centrifuge in a clean, dust-free location.
- Be sure to place the centrifuge on its feet.
- Avoid direct sunlight.

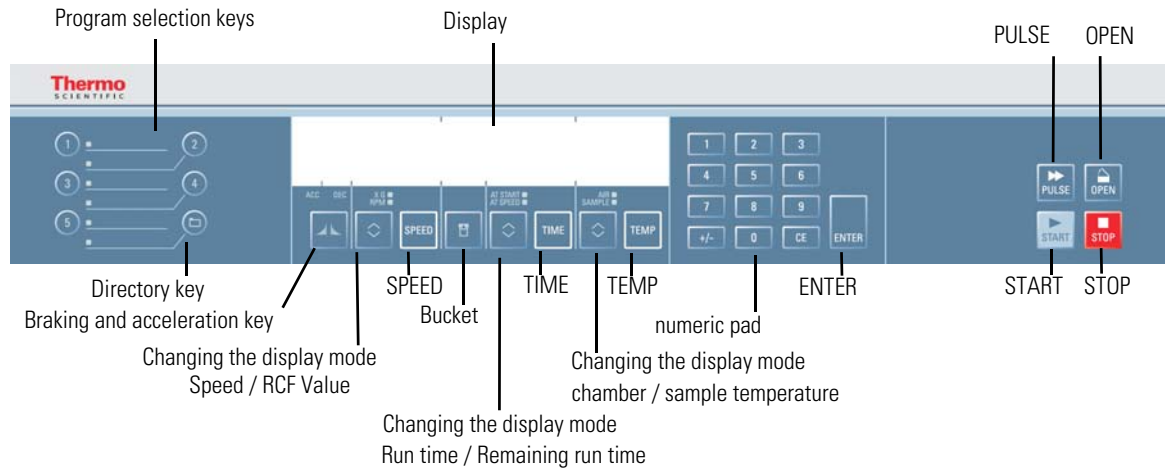
Control panel

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Control panel

The control panel contains the keys and displays of the centrifuge (only the power switch is located on the back of the device). All parameters can be selected and changed during operation.



Keys

The keys allow user intervention for controlling the operating mode as follows:

Key	Display contents
 Start	Normal start of the centrifuge
 Stop	End run manually
 Open lid	Automatic release (possible only when device is switched on); Emergency release (see "Mechanical emergency lid release" on page 7-2)
 Pulse	By pressing the  key the centrifuge starts immediately and accelerates up to the end speed. Releasing the key initiates a stopping process at the highest braking curves.
 Directory	By pressing the  key up and down you change the value in the display.
 Bucket	Use the key  in order to have all available bucket types displayed in succession.
 Braking and acceleration curves	Use the  key to toggle between braking and acceleration curves.
 Changing the display mode	Use the key  to change the display mode. (speed / RCF value, sample / chamber temperature, run time counter from start or preset speed on)

Operation

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Switch on centrifuge

1. Turn on the power switch on the back of the device.
The device performs a self-check of its software.
 - a. When the centrifuge lid is closed the following display shows:



The image shows a digital display with two lines. The top line displays '0' on the left and '0.00' on the right. The bottom line displays '9 9 15000' on the left, '20.30' in the middle, and '-10' on the right.

The top line shows the speed and the time. Both lines display **0**. The temperature indicator displays the current temperature inside the rotor chamber. The bottom line shows the values for the last run.


- b. When the centrifuge lid is open the following display shows:



The image shows a digital display with two lines. The top line displays 'LID OPEN'. The bottom line displays '9 9 15000 r 30.51' on the left and '-10' on the right.

The top line shows the message **lid open**. The bottom line shows the values for the last run.

Door opening

- c. Press the  key.



WARNING Do not reach into the crack between the lid and the housing. The lid is drawn shut automatically.

Use the emergency release only for malfunctions and power failures (see “[Mechanical emergency lid release](#)” on [page 7-2](#)).

Close door

2. Close the door by pressing down on it lightly in the middle or on both sides of it. One lock closes the lid completely.

Note The door should audibly click into place.

Rotor installation

The approved rotors for the Sorvall Legend X1 / X1R are listed in section “[Rotor selection](#)” on [page 1-6](#). Use only the rotors and accessories from this list in the centrifuge.



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

The centrifuge is equipped with an AutoLock™ locking system. This system is used to automatically lock the rotor to the centrifuge spindle. The rotor does not have to be bolted on to the centrifuge spindle.

Proceed as follows:

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

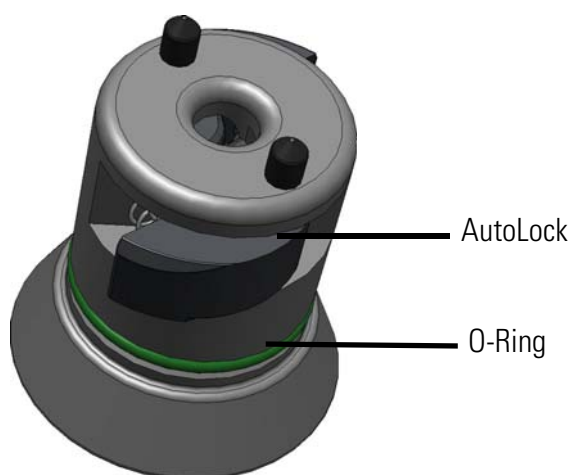


Figure 4-1. AutoLock

2. Place the rotor over the centrifuge spindle and let it slide slowly down the centrifuge spindle. The rotor clicks automatically into place.



CAUTION Do not force the rotor onto the centrifuge spindle. If the rotor is very light, then it may be necessary to press it onto the centrifuge spindle with a bit of pressure.

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



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



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

4. If available close the rotor with the rotor lid.



Be sure to check all sealings before starting any aerosol-tight applications.
See the information in the rotor instruction manual.


5. The display shows:

Entering parameters


Acceleration curve

The Sorvall Legend X1/X1R offers you a total of 9 acceleration and 10 braking curves with which samples and gradients can be centrifuged.

After the centrifuge is turned on, the last running profile selected is shown.

1. Press the  key once in order to open the acceleration profile selection menu.
The display shows the message **Set acceleration**.




2. Select the desired profile by entering a digit between 1-9 on the numeric pad. Curve number 1 is the slowest and curve number 9 the fastest.
3. Confirm your entry by pressing .



Braking curve

1. Press the  key twice in order to open the braking curve selection menu.
The display shows the message **Set deceleration**:




2. Select the desired curve by entering a digit between 1-9 on the numeric pad. Curve number 1 is the slowest and curve number 10 the fastest.
3. Confirm your entry by pressing .

Preselecting Speed / RCF

1. Press the  key.
The display shows the **RPM** or the "RCF"-value depending on the display setting. Press the  key to toggle between the two modes.



2. Enter the desired value using the numeric pad.
The digits show in sequential order.
3. Confirm your entry by pressing .
Your entry will be automatically confirmed if you do not press any key for 5 seconds.

Note If an extremely low RCF value has been selected, it will be corrected automatically if the resulting speed is less than 300 rpm. This is because 300 rpm is the lowest selectable speed.

Explanation of RCF value

The relative centrifugal force (RCF) is given as a multiple of the force of gravity g . It is a unitless numerical value which is used to compare the separation or sedimentation capacity of various devices, since it is independent of the type of device. Only the centrifuging radius and the speed come into play in it:

$$RCF = 11,18 \times \left\langle \frac{n}{1000} \right\rangle^2 \times r$$

r = centrifuging radius in cm


n = rotational speed in rpm

The maximum RCF value is related to the maximum radius of the tube opening.


Remember that this value is reduced depending on the tubes and adapters used.

This can be accounted for in the calculation above if required.


Run time preselection

1. Press the  key in order to open the runtime selection menu.
The display shows the message **Set Time**.
Enter the desired runtime in hh.mm



2. Press the  key repeatedly to switch over to mm:ss or Hold mode respectively.




3. Enter the desired runtime using the numeric pad.
The digits show in sequential order.
4. Confirm your entry by pressing .
Your entry will be automatically confirmed if you do not press any key for 5 seconds.


While the centrifuge is in operation, two different values can be displayed. The total run time and the run time after reaching the maximum speed.

Press the  key to toggle between the two display modes.


Continuous operation

During continuous operation, the centrifuge will continue running until you stop it manually with the  key.

Run time mode

Use the  key to set the run time counter start.

AT START


When AT START is lit, the run time will be counted right from pressing the  key.

AT SPEED

When AT SPEED is lit, the run time will be counted once the preset speed or the preset RCF-value respectively have been reached. In this case, the selected acceleration curve has no effect on the run time.

Preselecting the temperature

You can preselect temperatures between -10 °C and +40 °C.

While the centrifuge is in operation, two different values can be displayed. The sample temperature and the chamber temperature. Press the  key to toggle between the two display modes.



AIR

When AIR is lit, the temperature inside the rotor chamber will be controlled. This setting is recommended when using the centrifuges pretemp feature.

SAMPLE


When SAMPLE is lit, the temperature of the sample will be controlled.

To set the temperature, proceed as follows:

1. Press the key  in order to open the temperature selection menu.
The display shows the messages **Temperature**. Depending on the display mode setting, the value shown corresponds either to the sample temperature or to the inside chamber temperature. Press the  key to toggle between the two modes.




The display shows the message **Set temp**. The top row displays the values 0, 0.00, 25, and -10.

2. Enter the desired temperature using the numeric pad.
The digits show in sequential order.
3. Confirm your entry by pressing .
Your entry will be automatically confirmed if you do not press any key for 5 seconds.


Prewarming or precooling the centrifuge

For setting the pretemp value for the centrifuge proceed as follows:

1. Hold down the  key for a minimum of three seconds to open the temperature selection menu.
The display shows the message **Set PreTemp**.



The display shows the message **LID OPEN** and **Set PreTemp**. The value -10 is shown on the right side.

2. Enter the desired temperature using the numeric pad.
The digits show in sequential order.
3. Confirm your entry by pressing .
Your entry will be automatically confirmed if you do not press any key for 5 seconds.




The display shows the message **Close lid to PreTemp**. The top row displays the values 0, 0.00, 25, and -10.

4. The display shows:




The display shows the message **Press start**. The top row displays the values 0, 0.00, 25, and -10.

5. Press the  key.
The rotor chamber is cooled down or heated up to the preset temperature.



The LCD display shows the number 4000 in the top left, the text "PreCooling..." in the bottom left, the number 25 in the top right, and the number -10 in the bottom right.


6. Press the  key.
The display shows the current temperature.



The LCD display shows the number 4000 in the top left, the text "PreTemp ready" in the bottom left, the number -10 in the top right, and the number -10 in the bottom right.


Bucket selection

Bucket selection is only possible for swing-out rotors.
The bucket code corresponds to the last four digits of the bucket catalog number.

1. Press the  key.
The display shows the following message:




The LCD display shows the number 0 in the top left, the number 0.00 in the top middle, the number 25 in the top right, the text "Set bucket code" in the bottom left, and the number 3608 in the bottom right.

2. Press the  key repeatedly until the bucket being used is displayed.
Your entry will be automatically confirmed if you do not press any key for 5 seconds.

Bucket radius


Having entered the bucket code, you may want to specify the radius.

When you use adapters, you will have to specify the radius. For appropriate values please refer to the instruction manual for the rotor.


1. Press  to confirm your selection and open the radius input menu.



The LCD display shows the number 0 in the top left, the number 0.00 in the top middle, the number 25 in the top right, the text "Set radius" in the bottom left, and the text "default=185" in the bottom right.

The default value is marked accordingly. You can either confirm the default value by pressing  or enter a different radius.

2. Enter the radius using the numeric pad.
The digits show in sequential order.



3. Press  to confirm the new radius

Setting up a program

1. Enter the program parameters.
2. As described above, please enter braking and acceleration profile, speed/ RCF value, run time, temperatures, bucket code and bucket radius.
3. Press any of the program store keys for 4 seconds.

Configuring, storing and protecting a program



Programs can be stored and retrieved later by means of the assigned number.

1. Enter the program parameters as described above.
2. Press the program memory key to load any of the programs 1-5.
Press the  key in order to load any of the programs 1-99 by means of the numeric pad.
Enter the program number and confirm with .
3. You may want to enter a passcode to protect the data.
After four seconds the display shows the message **Program saved** or **Program locked**.



Overwriting a passcode-protected program

If you wish to overwrite a passcode-protected program proceed as follows:

1. Select the program you wish to change.
2. Press the program memory key to load any of the programs 1-5.
Press the  key in order to load any of the programs 1-99 by means of the numeric pad.
Enter the program number and confirm with .



3. Enter the passcode.
If you enter the wrong password, the following message appears:




The display restores the current values. Return to step 1.

Centrifugation

Once the rotor has been properly installed, the main switch has been turned on and the lid has been closed, you can start centrifuging.

Starting centrifuge program

Press the  key on the control panel. The centrifuge accelerates to the preset speed with the time display active.

If the speed setting is higher than the maximum permissible speed or RCF-value for the particular rotor, then the display will show the message **CHECK SET SPEED**. The centrifuge decelerates. Please enter a new value.

You cannot open the lid as long as the centrifuge is running.

Imbalance indicator

If a load is imbalanced, this will be indicated at speed higher than approx. 300 rpm by the message **Imbalance load**.


The run will terminate.


Check the loading and start the centrifuge once again. See the information on proper loading in the rotor instruction manual. For information on troubleshooting, see section “[Troubleshooting by user](#)” on [page 7-3](#).

Stopping the centrifugation program



With preset run time

Usually the run time is preset and you only have to wait until the centrifuge stops automatically when the preset time limit expires.

As soon as the speed drops to zero, the message **End** will appear in the display. By pressing the  key, you can open the door and remove the centrifuge material.


You can also stop the centrifuging program manually at any time by pressing the  key.

Continuous operation

If you selected continuous operation (see “Continuous operation” on page 4-6), you will have to stop the centrifuge manually. Press the  key on the control panel. The centrifuge will be decelerated at the designated rate. The message **End** will illuminate, and after pressing the  key, the lid will open and you can remove the centrifuged material.


Temperature adaptation during standstill

The temperature cannot be adapted until the rotor has been positively identified. For this, the centrifuge must have accelerated to over 500 rpm. The speed display will then show **End**.

When the rotor is not recognized (lid closed and  key not yet pressed, speed display **0**), the centrifuge responds by ensuring that the sample cannot freeze regardless of the rotor being used.

Short-term centrifugation

For short-term centrifuging, the Sorvall Legend X1 / X1R has a PULSE- function.

By holding down the  key, spinning will start and continue until the key is let go.

The centrifuge accelerates and brakes at maximum power. Any rpm or RCF entered beforehand is overridden.

Note The centrifuge accelerates to maximum speed, regardless of which rotor was installed.

Check carefully whether you have to maintain a certain speed for your application.

During the acceleration process, time is counted forwards in seconds. The reading stays displayed until the centrifuge lid is opened.

Removing the rotor

To remove the rotor, proceed as follows:

1. Open the centrifuge lid.
2. Grab the rotor handle with both hands and press against the green AutoLock key. At the same time, pull the rotor directly upwards with both hands and remove it from the centrifuge spindle. Make sure not to tilt the rotor while doing this.

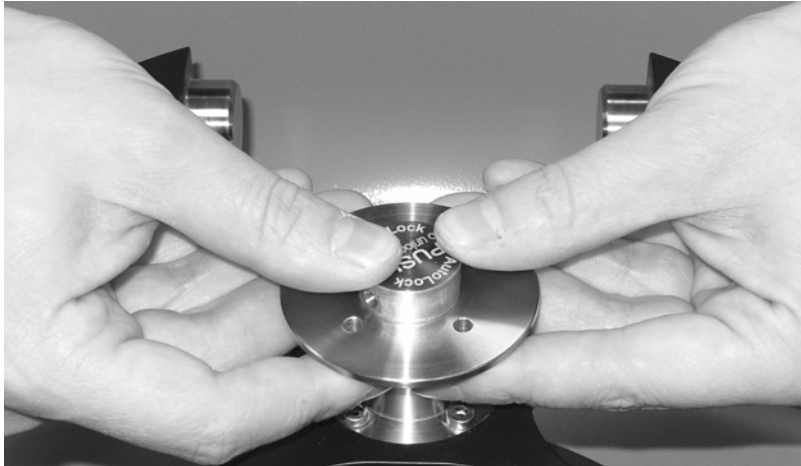


Figure 4-2. Press AutoLock key

Aerosol-tight rotors

When using an aerosol tight lid the rotor can only be removed with the lid closed. This is to protect you and the samples.



CAUTION Rotors supplied with a lid for aerosol-tight applications come with a mandrill, which belongs to the AutoLock. Be sure not to place the lid onto this mandrill to prevent it from being damaged.

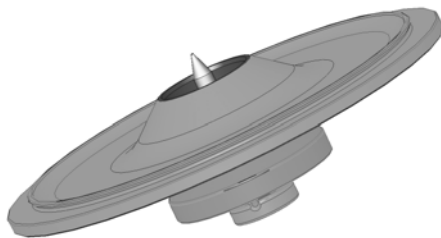


Figure 4-3. AutoLock-lid for aerosol-tight rotors

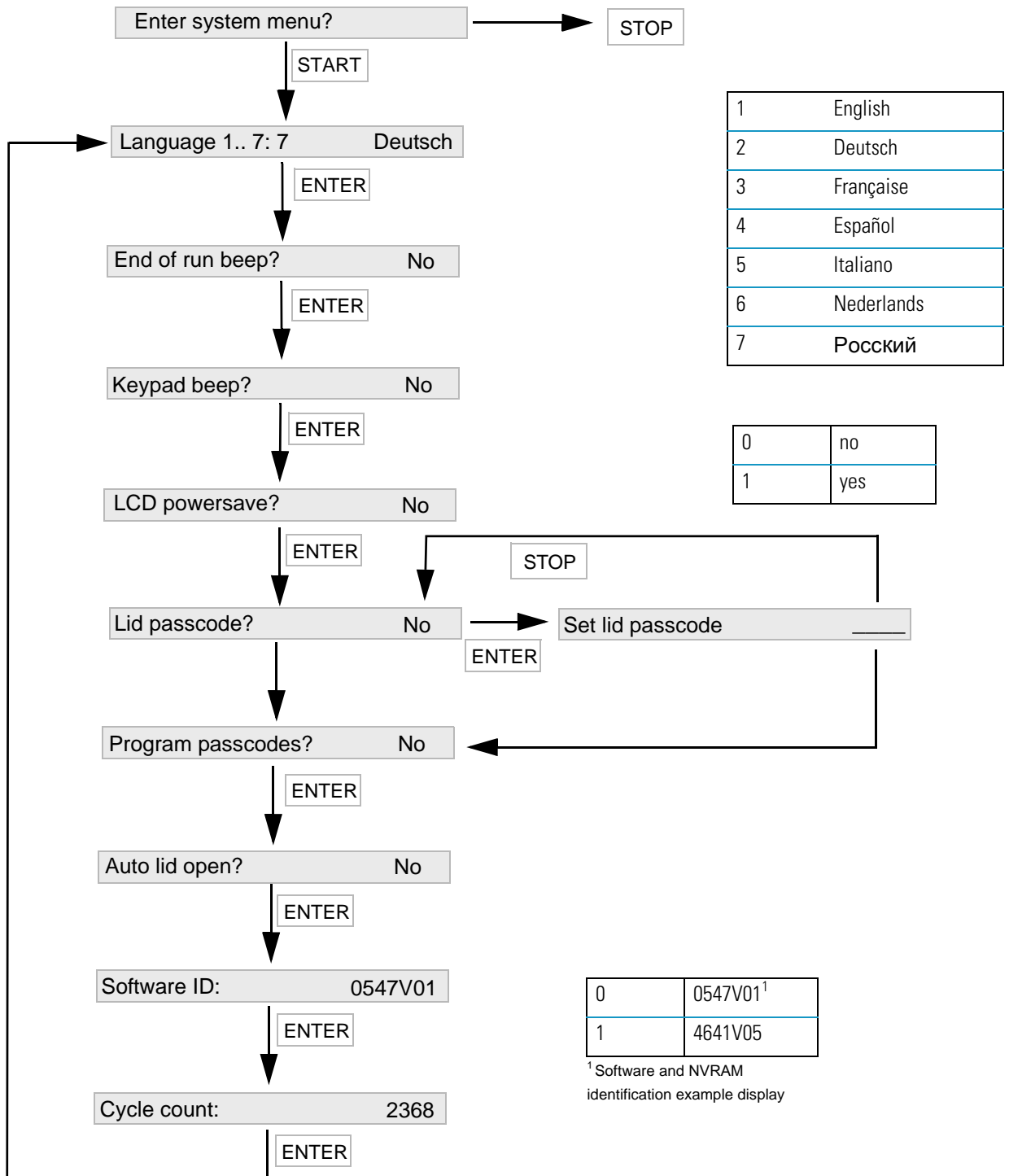


WARNING Mind the AutoLock-mandrill inside the lid. Do not touch the mandrill.

Turning off the centrifuge

1. To turn off the centrifuge put the mains switch to "0".

System menu



1	English
2	Deutsch
3	Française
4	Español
5	Italiano
6	Nederlands
7	Росский

0	no
1	yes


0	0547V01 ¹
1	4641V05


¹Software and NVRAM identification example display

Description

Enter system menu


To enter the system menu hold down any of the keys when switching the centrifuge on.

Press the  key in order to navigate through the system menu.

Press the  key to quit the system menu.


Language

In order to change the language in the display, press the number next to the desired language in the diagram on the numeric pad.

Press  key to confirm.


End of run beep

Press 1 (yes) on the numeric pad if the centrifuge should make beep after the run. Otherwise press 0 (no).

Press  key to confirm.


Keypad beep

Press 1 (yes) on the numeric pad if the centrifuge should make beep when pressing any key. Otherwise press 0 (no).

Press  key to confirm.

LCD powersave


Press 1 (yes) on the numeric pad if the centrifuge should enter a powersave mode after the run. Otherwise press 0 (no).

Press  key to confirm.

Lid passcode


Press 1 (yes) on the numeric pad if the centrifuge door should be protected with a passcode. Enter passcode.

If the door should not be protected with a passcode press 2 (no) on the numeric pad.

Press  key to confirm.


Program passcodes

Press 1 (yes) on the numeric pad if the centrifuge programs should be protected with a passcode. Otherwise press 0 (no).

Press  key to confirm.


Auto lid open

Press 1 (yes) on the numeric pad if the centrifuge should open after the run. Otherwise press 0 (no).

Press  key to confirm.


Software ID

Here you fine the current software version.

Press  key to confirm.

Cycle counter

Here you fine the current numbers of cycles.

Press  key to confirm.

Maintenance and care

Contents

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



CAUTION During maintenance operations, always disconnect the centrifuge from the power.

Cleaning intervals

For the sake of personal, environmental, and material protection, it is your duty to clean and if necessary disinfect the centrifuge on a regular basis.

Maintenance	Recommended interval
Cabinet / Housing	Every month or when polluted
Rotor chamber	Daily or when polluted
Rotor	Daily or when polluted
Accessories	Daily or when polluted
Cabinet	Once per month
Ventilation holes	Every six months by a service technician



CAUTION Refrain from using any other cleaning or decontamination procedure than those recommended here, if you are not entirely sure that the intended procedure is safe for the equipment.
Use only approved cleansers.
If in doubt, contact Thermo Fisher Scientific.

Cleaning

When cleaning centrifuge mind the following:

- Use warm water with a neutral solvent.
- Never use caustic cleaning agents such as soap suds, phosphoric acid, bleaching solutions or scrubbing powder.
- Rinse the cavities out thoroughly.
- Use a soft brush without metal bristles to remove stubborn residue.
- Afterwards rinse with distilled water.
- Place the rotors on a plastic grate with their cavities pointing down.
- If drying boxes are used, the temperature must never exceed 50 °C, since higher temperatures could damage the material and shorten the lifetime of the parts.
- Use only disinfectants with a pH of 6-8.
- Dry aluminum parts off with a soft cloth.

- After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (7000 9824). Also treat the cavities with oil.
- Store the aluminum parts at room temperature or in a cold-storage room with the cavities pointing down.



CAUTION Before using any cleaning or decontamination methods except those recommended by the manufacturer, users should check with the manufacturer that the proposed method will not damage the equipment.

Clean centrifuge and accessories as follows:

1. Open the centrifuge.
2. Turn off the centrifuge.
3. Pull out the power supply plug.
4. Grasp the rotor with both hands and lift it vertically off the centrifuge spindle.
5. Remove the centrifuge tubes and adapters.
6. Use a neutral cleaning agent with a pH value between 6 and 8 for cleaning.
7. Use a small nylon brush to clean the cavities of fixed angle rotors and buckets.



CAUTION Do not use metal wire brushes or other tools that may scratch the anodized surface of the buckets or rotors.

8. Dry all of the rotors and accessories after cleaning with a cloth or in a warm air cabinet at a maximum temperature of 50 °C.
- After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (70009824). Also treat the cavities with oil.
 - Tread the bold of the swing out rotor with bold grease (75003786).



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

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

Disinfection

Disinfect the centrifuge immediately whenever infectious material has spilled during centrifugation.



WARNING Infectious material can get into the centrifuge when a tube breaks or as a result of spills. Keep in mind the risk of infection when touching the rotor and take all necessary precautions.

In case of contamination, make sure that others are not put at risk.
Decontaminate the affected parts immediately.
Take other precautions if need be.

The rotor chamber and the rotor should be treated preferably with a neutral disinfectant.



CAUTION Before using any cleaning or decontamination methods except those recommended by the manufacturer, users should check with the manufacturer that the proposed method will not damage the equipment.

Observe the safety precautions and handling instructions for the cleaning agents used.

Contact the Service Department of Thermo Fisher Scientific for questions regarding the use of other disinfectants.

Disinfect the rotor and accessories as follows:

1. Open the centrifuge.
2. Turn off the centrifuge.
3. Pull out the power supply plug.
4. Grasp the rotor with both hands and lift it vertically off the centrifuge spindle.
5. Remove the centrifuge tubes and adapters and dispose of them or disinfect them.
6. Treat the rotor and accessories according to the instructions for the disinfectant. Adhere strictly to the given application times.
7. Be sure the disinfectant can drain off the rotor.
8. Rinse the rotor and accessories thoroughly with water.
9. Dispose of the disinfectant according to the applicable guidelines.
10. Dry all of the rotors and accessories after cleaning with a cloth or in a warm air cabinet at a maximum temperature of 50 °C.
11. After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (70009824). Also treat the cavities with oil.
12. Treat the bolt of the swing out rotor with bolt grease (75003786).

Decontamination

Decantamine the centrifuge immediately whenever radioactive material has spilled during centrifugation.



WARNING Radioactive material can get into the centrifuge when a tube breaks or as a result of spills. Keep in mind the risk of infection when touching the rotor and take all necessary precautions.

In case of contamination, make sure that others are not put at risk.

Decontaminate the affected parts immediately.

Take other precautions if need be.



CAUTION Before using any cleaning or decontamination methods except those recommended by the manufacturer, users should check with the manufacturer that the proposed method will not damage the equipment.

For general radioactive decontamination use a solution of equal parts of 70% ethanol, 10% SDS and water.

1. Open the centrifuge.
2. Turn off the centrifuge.
3. Pull out the power supply plug.
4. Grasp the rotor with both hands and lift it vertically off the centrifuge spindle.
5. Remove the centrifuge tubes and adapters and dispose of them or disinfect them.
6. Rinse the rotor first with ethanol and then with de-ionized water.
 - Adhere strictly to the given application times.
7. Be sure the decontamination solution can drain off the rotor.
8. Rinse the rotor and accessories thoroughly with water.
9. Dispose of the decontamination solution according to the applicable guidelines.
10. Dry all of the rotors and accessories after cleaning with a cloth or in a warm air cabinet at a maximum temperature of 50 °C.
11. After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (70009824). Also treat the cavities with oil.
12. Treat the bolt of the swing out rotor with bolt grease (75003786).

Autoclaving

1. Before autoclaving clean rotor and accessories and described above.
2. Place the rotor on a flat surface.
 - Rotors and adapter can be autoclaved at 121 °C.

- The maximum permissible autoclave cycle is 20 minutes at 121 °C.

Note No chemical additives are permitted in the steam.



CAUTION Never exceed the permitted temperature and duration when autoclaving. If the rotor shows signs of corrosion or wear, it must be replaced.

Service of Thermo Fisher Scientific

Thermo Fisher Scientific recommends having the centrifuge and accessories serviced once a year by an authorized service technician. The service technician check the following:

- the electrical equipment;
- the suitability of the set-up site;
- the lid lock and the safety system;
- the rotor;
- the fixation of the rotor and the drive shaft.

Thermo Fisher Scientific offers inspection and service contracts for this work. Any necessary repairs are performed for free during the warranty period and afterwards for a charge.

This is only valid if the centrifuge has only been maintained by a Thermo Fisher Scientific service technician.

Troubleshooting

Contents

- “Mechanical emergency lid release” on page 7-2
- “Troubleshooting by user” on page 7-3
- “When to contact customer service” on page 7-6

Mechanical emergency lid release

During a power failure, you will not be able to open the centrifuge lid with the regular electric lid release. A mechanical override is provided to allow sample recovery in the case of an emergency. However, this should be used only in emergencies and after the rotor has come to a complete stop.



WARNING The rotor can still be spinning at high speed. If touched, it can cause serious injuries.

Always wait a few minutes until the rotor has come to a stop without braking. The brake does not work when there is no current. The braking process lasts much longer than usual.

Proceed as follows:

1. Make sure the rotor has stopped (view port in the lid).



WARNING Never use your hand or other tools to brake the rotor.

2. Pull out the power supply plug.
3. On the left side of the housing is one white plastic plugs which you can pry out of the side plate with a screwdriver or a knife.
Pull the release cord attached to it to trigger the mechanical lid release. The lid will open and the samples can be removed.

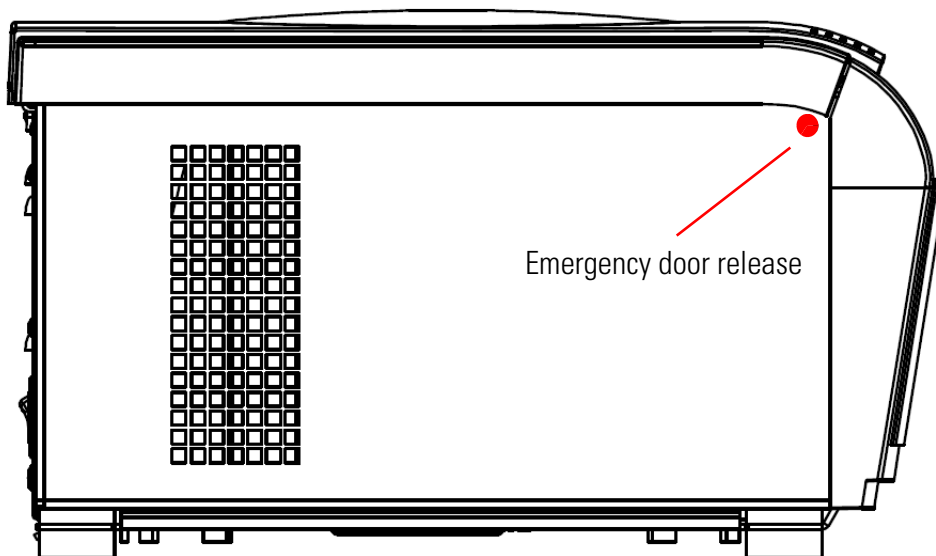



Figure 7-1. Emergency door release

4. Push the cord back into the centrifuge and mount the plug.

Reconnect the centrifuge once the power has been restored. Switch on the centrifuge. Press the  key to have the door locks operative again.

Troubleshooting by user



If problems occur other than those listed in this table, the authorized customer service representative must be contacted.

Failure message	Problem with centrifuge	Possible causes and cures
Chamber overtemp	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	Overheating in chamber. Check the function of the refrigeration unit. Clean the air inlet for the condenser. Restart the centrifuge. If an error message appears again, inform your service technician.
Incorrect bucket ID	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	Bucket code is undefined for the rotor detected, check the set points for the given bucket code. Is it permitted to use the current bucket in the rotor currently mounted? Restart the centrifuge. If an error message appears again, inform your service technician.
Unapproved rotor	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	Rotor code is not in the rotor table. Is it permitted to use the rotor currently mounted in this device? Restart the centrifuge. If an error message appears again, inform your service technician.
Rotor ID failure	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The rotor could not be identified. Check to see if the rotor is properly installed. Restart the centrifuge. If an error message appears again, inform your service technician.
Lid blocked	Centrifuge does not open	Restart the centrifuge. The emergency lid release enables you to retrieve your samples. If an error message appears again, inform your service technician.
Motor overtemp	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	Restart the centrifuge. If an error message appears again, inform your service technician.
PCB overtemp	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	Restart the centrifuge. If an error message appears again, inform your service technician.



Failure message	Problem with centrifuge	Possible causes and cures
Error lid lock	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The lid opens while the device is running. Close the lid and restart the centrifuge. If an error message appears again, inform your service technician.
Imbalanced load	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	Imbalance detected. Check the load placed in the rotor. Check that the rotor cross bolts are well greased. Restart the centrifuge. If an error message appears again, inform your service technician.
Check Set Speed	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The set point speed is higher than the maximum rotor speed. Correct the value. Restart the centrifuge. If an error message appears again, inform your service technician.
E-01 - E-12	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	Error during the self-test of the centrifuge program and the electronics. Restart the centrifuge. If an error message appears again, inform your service technician.
E-13	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The check sum in the data memory is incorrect. The software corrects errors automatically. Check the values of the set point settings, etc. Restart the centrifuge. If an error message appears again, inform your service technician.
E-15-E-16	Temperature sensor broken / controller defective	Malfunction in the temperature detection. Restart the centrifuge. If an error message appears again, inform your service technician.
E-17	Speed for rotor detection exceeded	Restart the centrifuge. If an error message appears again, inform your service technician.
E-21 - E-22	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The rotor could not be identified. Check to see if the rotor is properly installed. Restart the centrifuge. If an error message appears again, inform your service technician.
E-23	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The speed control measurement returned a different result. Restart the centrifuge. If an error message appears again, inform your service technician.

Failure message	Problem with centrifuge	Possible causes and cures
E-25-E-27	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	Time has expired for the lid lock drive while opening the lid. Restart the centrifuge. If an error message appears again, inform your service technician.
E-28	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	Error during the self-test of the centrifuge program and the electronics. Restart the centrifuge. If an error message appears again, inform your service technician.
E-29	The centrifuge cannot be operated. The run does not start.	Check whether you selected the right bucket. Is it easy to turn the rotor when the lid is open? Does the rotor rub against the device? Restart the centrifuge. If an error message appears again, inform your service technician.
E-30	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	Restart the centrifuge. If an error message appears again, inform your service technician.
E-33	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	Overpressure in the refrigeration unit. Clean the air inlet for the condenser. Restart the centrifuge. If an error message appears again, inform your service technician.
E-34-E-36	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	Error during the self-test of the centrifuge program and the electronics. Restart the centrifuge. If an error message appears again, inform your service technician.
E-40	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The centrifuge accelerates too slowly. Is the rotor properly installed? Check whether you selected the right bucket. Is it easy to turn the rotor when the lid is open? Does the rotor rub against the device? Restart the centrifuge. If an error message appears again, inform your service technician.
E-41-E-74	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	Error during the self-test of the centrifuge program and the electronics. Restart the centrifuge. If an error message appears again, inform your service technician.

When to contact customer service

If you need to contact customer service, please provide the order no. and the serial no. of your device. This information can be found on the back near the inlet for the power supply cable.

To identify the software version, proceed as follows:

1. Hold down any of the keys and then switch on the centrifuge.
You enter the system menu.
2. Press the  key.
3. Press and hold the  key, until the following message is displayed:

Software ID: XXXXXXXX

4. Communicate the software version to the service technician.

Chemical compatibility chart

CHEMICAL	MATERIAL	ALUMINIUM	ANODIC COATING for ALUMINIUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL	NYLON	PET*, POLYCLEAR, CLEARCRIMP	POLYALLUMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A, TEFLON	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON	VITON
2-mercaptoethanol	S	S	U	-	S	M	S	-	S	U	S	S	U	S	S	-	S	S	S	S	U	S	S	S	S	S	S	
Acetaldehyde	S	-	U	U	-	-	-	M	-	U	-	-	-	M	U	U	U	M	M	-	M	S	U	-	S	-	U	
Acetone	M	S	U	U	S	U	M	S	S	U	U	S	U	S	U	U	U	S	S	U	U	S	M	M	S	U	U	
Acetonitrile	S	S	U	-	S	M	S	-	S	S	U	S	U	M	U	U	-	S	M	U	U	S	S	S	S	U	U	
Alconox	U	U	S	-	S	S	S	-	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	U	
Allyl Alcohol	-	-	-	U	-	-	S	-	-	-	-	S	-	S	S	M	S	S	S	-	M	S	-	-	S	-	-	
Aluminum Chloride	U	U	S	S	S	S	U	S	S	S	S	M	S	S	S	S	-	S	S	S	S	S	M	U	U	S	S	
Formic Acid (100 %)	-	S	M	U	-	-	U	-	-	-	-	U	-	S	M	U	U	S	S	-	U	S	-	U	S	-	U	
Ammonium Acetate	S	S	U	-	S	S	S	-	S	S	S	S	S	S	S	U	-	S	S	S	S	S	S	S	S	S	S	
Ammonium Carbonate	M	S	U	S	S	S	S	S	S	S	S	S	S	S	U	U	-	S	S	S	S	S	S	M	S	S	S	
Ammonium Hydroxide (10 %)	U	U	S	U	S	S	M	S	S	S	S	S	-	S	U	M	S	S	S	S	S	S	S	S	S	M	S	
Ammonium Hydroxide (28 %)	U	U	S	U	S	U	M	S	S	S	S	S	U	S	U	M	S	S	S	S	S	S	S	S	S	M	S	
Ammonium Hydroxide (conc.)	U	U	U	U	S	U	M	S	-	S	-	S	U	S	U	U	S	S	S	-	M	S	S	S	S	-	U	
Ammonium Phosphate	U	-	S	-	S	S	S	S	S	S	S	S	-	S	S	M	-	S	S	S	S	S	S	M	S	S	S	
Ammonium Sulfate	U	M	S	-	S	S	U	S	S	S	S	S	S	S	S	S	-	S	S	S	S	S	S	U	S	S	U	
Amyl Alcohol	S	-	M	U	-	-	S	S	-	M	-	S	-	M	S	S	S	S	M	-	-	-	U	-	S	-	M	
Aniline	S	S	U	U	S	U	S	M	S	U	U	U	U	U	U	U	-	S	M	U	U	S	S	S	S	U	S	
Sodium Hydroxide (<1 %)	U	-	M	S	S	S	-	-	S	M	S	S	-	S	M	M	S	S	S	S	S	S	M	S	S	-	U	
Sodium Hydroxide (10 %)	U	-	M	U	-	-	U	-	M	M	S	S	U	S	U	U	S	S	S	S	S	S	M	S	S	-	U	
Barium Salts	M	U	S	-	S	S	S	S	S	S	S	S	S	S	S	M	-	S	S	S	S	S	M	S	S	S	S	
Benzene	S	S	U	U	S	U	M	U	S	U	U	S	U	U	U	M	U	M	U	U	U	U	U	U	S	U	S	
Benzyl Alcohol	S	-	U	U	-	-	M	M	-	M	-	S	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	

A Chemical compatibility chart

CHEMICAL	MATERIAL																										
	ALUMINIUM	ANODIC COATING for ALUMINIUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL	NYLON	PET*, POLYCLEAR, CLEARCRIMP	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYETHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A, TEFLON	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON	VITON
Cesium Bromide	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Cesium Chloride	M	S	S	U	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Cesium Formate	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Cesium Iodide	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Cesium Sulfate	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Chloroform	U	U	U	U	S	S	M	U	S	U	U	M	U	M	U	U	U	M	M	U	U	S	U	U	U	M	S
Chromic Acid (10 %)	U	-	U	U	S	U	U	-	S	S	S	U	S	S	M	U	M	S	S	U	M	S	M	U	S	S	S
Chromic Acid (50 %)	U	-	U	U	-	U	U	-	-	-	S	U	U	S	M	U	M	S	S	U	M	S	-	U	M	-	S
Cresol Mixture	S	S	U	-	-	-	S	-	S	U	U	U	U	U	U	-	-	U	U	-	U	S	S	S	S	U	S
Cyclohexane	S	S	S	-	S	S	S	U	S	U	S	S	U	U	U	M	S	M	U	M	M	S	U	M	M	U	S
Deoxycholate	S	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	S	S	S	S
Distilled Water	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Dextran	M	S	S	S	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S
Diethyl Ether	S	S	U	U	S	S	S	U	S	U	U	S	U	U	U	U	U	U	U	U	U	S	S	S	S	M	U
Diethyl Ketone	S	-	U	U	-	-	M	-	S	U	-	S	-	M	U	U	U	M	M	-	U	S	-	-	S	U	U
Diethylpyrocarbonate	S	S	U	-	S	S	S	-	S	S	U	S	U	S	U	-	-	S	S	S	M	S	S	S	S	S	S
Dimethylsulfoxide	S	S	U	U	S	S	S	-	S	U	S	S	U	S	U	U	-	S	S	U	U	S	S	S	U	U	U
Dioxane	M	S	U	U	S	S	M	M	S	U	U	S	U	M	U	U	-	M	M	M	U	S	S	S	S	U	U
Ferric Chloride	U	U	S	-	-	-	M	S	-	M	-	S	-	S	-	-	-	S	S	-	-	-	M	U	S	-	S
Acetic Acid (Glacial)	S	S	U	U	S	S	U	M	S	U	S	U	U	U	U	U	M	S	U	M	U	S	U	U	S	-	U
Acetic Acid (5%)	S	S	M	S	S	S	M	S	S	S	S	S	M	S	S	S	S	S	S	S	M	S	S	M	S	S	M
Acetic Acid (60%)	S	S	U	U	S	S	U	-	S	M	S	U	U	M	U	S	M	S	M	S	M	S	M	U	S	M	U
Ethyl Acetate	M	M	U	U	S	S	M	M	S	S	U	S	U	M	U	U	-	S	S	U	U	S	M	M	S	U	U
Ethyl Alcohol (50 %)	S	S	S	S	S	S	M	S	S	S	S	S	U	S	U	S	S	S	S	S	S	S	S	M	S	M	U
Ethyl Alcohol (95 %)	S	S	S	U	S	S	M	S	S	S	S	S	U	S	U	-	S	S	S	M	S	S	S	U	S	M	U
Ethylene Dichloride	S	-	U	U	-	-	S	M	-	U	U	S	U	U	U	U	U	U	U	-	U	S	U	-	S	-	S
Ethylene Glycol	S	S	S	S	S	S	S	S	S	S	S	S	-	S	U	S	S	S	S	S	S	S	S	M	S	M	S
Ethylene Oxide Vapor	S	-	U	-	-	U	-	-	S	U	-	S	-	S	M	-	-	S	S	S	U	S	U	S	S	S	U
Ficoll-Hypaque	M	S	S	-	S	S	S	-	S	S	S	S	-	S	S	-	S	S	S	S	S	S	S	M	S	S	S
Hydrofluoric Acid (10 %)	U	U	U	M	-	-	U	-	-	U	U	S	-	S	M	U	S	S	S	S	M	S	U	U	U	-	-
Hydrofluoric Acid (50 %)	U	U	U	U	-	-	U	-	-	U	U	U	U	S	U	U	U	S	S	M	M	S	U	U	U	-	M
Hydrochloric Acid (conc.)	U	U	U	U	-	U	U	M	-	U	M	U	U	M	U	U	U	-	S	-	U	S	U	U	U	-	-

CHEMICAL	MATERIAL																										
	ALUMINIUM	ANODIC COATING for ALUMINIUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL	NYLON	PET*, POLYCLEAR, CLEARCRIMP	POLYALLUMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYETHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A, TEFLON	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON	VITON
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	M	S	U	S	
Calcium Chloride	M	U	S	S	S	S	S	S	S	S	S	S	S	S	M	S	-	S	S	S	S	S	S	M	S	S	S
Calcium Hypochlorite	M	-	U	-	S	M	M	S	-	M	-	S	-	S	M	S	-	S	S	S	M	S	M	U	S	-	S
Kerosene	S	S	S	-	S	S	S	U	S	M	U	S	U	M	M	S	-	M	M	M	S	S	U	S	S	U	S
Sodium Chloride (10%)	S	-	S	S	S	S	S	-	-	-	-	S	S	S	S	S	-	S	S	S	S	-	S	S	M	-	S
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	M	U	S	U	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	U	U	U
Metrizamide	M	S	S	-	S	S	S	-	S	S	S	S	-	S	S	-	-	S	S	S	S	S	M	S	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

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N-Butyl Phthalate	S	S	U	-	S	S	S	-	S	U	U	S	U	U	U	M	-	U	U	S	U	S	M	M	S	U	S
N, N-Dimethylformamide	S	S	S	U	S	M	S	-	S	S	U	S	U	S	U	U	-	S	S	U	U	S	M	S	S	S	U
Sodium Borate	M	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	-	S	S	S	S	S	S	M	S	S	S
Sodium Bromide	U	S	S	-	S	S	S	-	S	S	S	S	S	S	S	S	-	S	S	S	S	S	S	M	S	S	S
Sodium Carbonate (2 %)	M	U	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S
Sodium Dodecyl Sulfate	S	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S
Sodium Hypochlorite (5 %)	U	U	M	S	S	M	U	S	S	M	S	S	S	M	S	S	S	S	M	S	S	S	M	U	S	M	S
Sodium Iodide	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Sodium Nitrate	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	-	S	S	S	S	S	U	S	S	S	S
Sodium Sulfate	U	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S
Sodium Sulfide	S	-	S	S	-	-	-	S	-	-	-	S	S	S	U	U	-	-	S	-	-	-	S	S	M	-	S
Sodium Sulfite	S	S	S	-	S	S	S	S	M	S	S	S	S	S	S	M	-	S	S	S	S	S	S	S	S	S	S
Nickel Salts	U	S	S	S	S	S	-	S	S	S	-	-	S	S	S	S	-	S	S	S	S	S	S	M	S	S	S
Oils (Petroleum)	S	S	S	-	-	-	S	U	S	S	S	S	U	U	M	S	M	U	U	S	S	S	U	S	S	S	S
Oils (Other)	S	-	S	-	-	-	S	M	S	S	S	S	U	S	S	S	S	U	S	S	S	S	-	S	S	M	S
Oleic Acid	S	-	U	S	S	S	U	U	S	U	S	S	M	S	S	S	S	S	S	S	S	S	M	U	S	M	M
Oxalic Acid	U	U	M	S	S	S	U	S	S	S	S	S	U	S	U	S	S	S	S	S	S	S	S	U	M	S	S
Perchloric Acid (10 %)	U	-	U	-	S	U	U	-	S	M	M	-	-	M	U	M	S	M	M	-	M	S	U	-	S	-	S
Perchloric Acid (70 %)	U	U	U	-	-	U	U	-	S	U	M	U	U	M	U	U	U	M	M	U	M	S	U	U	S	U	S
Phenol (5 %)	U	S	U	-	S	M	M	-	S	U	M	U	U	S	U	M	S	M	S	U	U	S	U	M	M	M	S
Phenol (50 %)	U	S	U	-	S	U	M	-	S	U	M	U	U	U	U	U	S	U	M	U	U	S	U	U	U	M	S
Phosphoric Acid (10 %)	U	U	M	S	S	S	U	S	S	S	S	U	-	S	S	S	S	S	S	S	S	S	U	M	U	S	S
Phosphoric Acid (conc.)	U	U	M	M	-	-	U	S	-	M	S	U	U	M	M	S	S	S	M	S	M	S	U	M	U	-	S
Physiologic Media (Serum, Urine)	M	S	S	S	-	-	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Picric Acid	S	S	U	-	S	M	S	S	S	M	S	U	S	S	S	U	S	S	S	S	U	S	U	M	S	M	S
Pyridine (50 %)	U	S	U	U	S	U	U	-	U	S	S	U	U	M	U	U	-	U	S	M	U	S	S	U	U	U	U
Rubidium Bromide	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Rubidium Chloride	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Sucrose	M	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
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	U	S	S	S	S
Nitric Acid (10 %)	U	S	U	S	S	U	U	-	S	U	S	U	-	S	S	S	S	S	S	S	S	S	M	S	S	S	S

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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	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	

*Polyethyleneterephthalate

Key

- S Satisfactory
- M Moderate attack, may be satisfactory for use in centrifuge depending on length of exposure, speed involved, etc. Suggest testing under actual conditions of use.
- U Unsatisfactory, not recommended.
- Performance unknown; suggest testing, using sample to avoid loss of valuable material.

A Chemical compatibility chart

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

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Shown pictures within the manual are examples and may differ considering the set parameters and language. Pictures of the user interface within the manual are showing the English version as example.

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