



Thermo Scientific

RC 12BP Plus

Instruction Manual

50125346-3

December 2010

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KONFORMITÄTSERKLÄRUNG

(2006/42/EG; 2006/95/EG; 2004/108/EG)

DECLARATION OF CONFORMITY

(2006/42/EC; 2006/95/EC; 2004/108/EC)

DÉCLARATION DE CONFORMITÉ

(2006/42/CE; 2006/95/CE; 2004/108/CE)

Produkt:	Labor-Zentrifuge
Product:	Laboratory centrifuge
Produit:	Centrifugeuse de laboratoire
Gerät:	
Model:	RC12 BP+
Modèle:	RC BIOS
Best.-Nr.:	75007032 , 75007033
Cat.-No.:	75007036 , 75007037
Référence:	

Dieses Produkt wurde in Übereinstimmung mit den Richtlinien 2006/95/EG Niederspannung, 2006/42/EG Maschinen, 2004/108/EG elektromagnetische Verträglichkeit (EMV) hergestellt und geprüft.

This product is manufactured and duly carried out in compliance with directions 2006/95/EC Low Voltage, 2006/42/EC Machinery, 2004/108/EC electromagnetic compatibility (EMC).

Ce produit est fabriqué et testé selon les directives 2006/95/CE matériel électrique destiné à être employé dans certaines limites de tension, 2006/42/CE machines, 2004/108/CE la compatibilité électromagnétique.

Normen / Standards / Normes:

EN 61010-1: 2004 / EN 61010-2-020: 2006
EN 61326-1: 2006 / EN 55011B: 2007 / EN 61000-6-2: 2005

Osterode, den 08.09.2010

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Freigegeben	Abdullah Laaboubi	08.09.2010	V:\HSDOC\KONF	

WEEE Conformity

This product is subject to the regulations of the EU Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96 It is marked by the following symbol:



Thermo Fisher Scientific has entered into agreements with recycling and disposal companies in all EU Member States for the recycling and disposal of this device. For information on recycling and disposal companies in Germany and on the products of Thermo Fisher Scientific, which fall under the RoHS Directive (Restriction of the use of certain hazardous substances in electrical and electronic equipment), please visit the website www.thermo.com/WEEERoHS

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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.



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 a rotor failure.



This symbol refers 3 phase alternating current.

Scope of Supply

Article Number		Quantity	Check
	Centrifuge RC 12BP+	1	<input type="checkbox"/>
	Power supply cable	1	<input type="checkbox"/>
50105346	Instruction manual	1	<input type="checkbox"/>
70907249	Installation kit	1	<input type="checkbox"/>

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

Intended Use

- 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.
- The centrifuge is designed to also run other containers filled with chemicals, environmental samples and other non-human body samples.
- This centrifuge should be operated by trained specialists only.

Accident Prevention



Prerequisite for the safe operation of the centrifuge 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 (12 inch) 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 and main switch 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 centrifuge, the following general safety regulations must be followed. Ignoring the safety regulations can result in severe damage and injuries.

- Do not manipulate the safety devices
- The centrifuge should be operated by trained specialists only.
- The centrifuge is to be used for its intended purpose only.
- Plug the centrifuge only into sockets which have been properly grounded.
- Do not move the centrifuge while it is running.
- 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 in section “Rotor Installation” on page 4-3.
- 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 “Failure message” on page 7-3).
- 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.
- 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.

P Precautions

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

IF A HAZARDOUS SITUATION OCCURS, TURN OFF THE POWER SUPPLY TO THE CENTRIFUGE AND LEAVE THE AREA IMMEDIATELY.

Normal use

The centrifuge is to be used for separating materials of different density or particle size suspended in a liquid.

Maximum sample density at maximum speed: $1,2 \frac{g}{cm^3}$

Introduction and Description

Contents

- “Characteristics of the RC 12BP+” on page 1-2
- “Technical Data” on page 1-3
- “Directives, Standards and Guidelines” on page 1-4
- “Functions and Features” on page 1-4
- “Mains Supply” on page 1-5
- “Rotor Selection” on page 1-5

Characteristics of the RC 12BP+

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, running time, temperature, and running 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.

The RC 12BP+ is equipped with various safety features:

Housing, rotor chamber, baseframe, and guard ring are made of high-strength, high-quality steel.

- 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.
- Electronic imbalance detection.
- Lid emergency release: For emergencies only, e.g. during power failures (see “[Failure message](#)” on [page 6-3](#))

Technical Data

The technical data of the RC 12BP+ is listed in the following table.

Table 1-1. Technical Data RC 12BP+

Feature	Value		
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 +40° C	+35.6° F to +104° F	
Overvoltage category	II	II	II
Pollution degree	2	2	2
Heat dissipation	230V	208V	400V
	~5.2 kW	~4.5 kW	~5.8 kW
	17700 BTU/h	15300 BTU/h	19700 BTU/h
IP	20	20	20
Running time	unlimited	unlimited	unlimited
Maximum speed n_{max}	4700 rpm	4700 rpm	4700 rpm
Minimum speed n_{min}	300 rpm	300 rpm	300 rpm
Minimum sample temperature	4°C at 4700 rpm	4°C at 4550 rpm	4°C at 4700 rpm
Maximum RCF value at n_{max}	7340x g	7340 x g	7340 x g
Maximum kinetic energy	<313 kJ	< 313 kJ	< 313 kJ
Noise level at maximum speed ¹	< 65 dB (A)	< 65 dB (A)	< 65 dB (A)
Temperature setting range	-10 °C to +40 °C	-10 °C to +40 °C	-10 °C to +40 °C
Dimensions			
Height	1178 mm	46.3 inch	
Width	800 mm	31.5 inch	
Depth	905 mm	35.6 inch	
Length power cord	3000 mm	118.1 inch	
Weight without rotor	475 kg	1047 lb	

¹front side measurement

Directives, Standards and Guidelines

Table 1-2. Directives, standards and guidelines

Tension / Frequency		Produced and inspected according to the following standards and guidelines
220V-230V 50Hz, 400V 50Hz	2006/95/EC Low Voltage Directive: 2006/42/EC Machine Directive: 2004/108/EC EMC Directive	EN 61010-1, 2 nd Edition EN 61010-2-020, 2 nd Edition EN 61326-1 EN 55011B EN 61000-6-2
208-220V 60Hz, 230V 60Hz	The centrifuges are produced and inspected according to the following standards and guidelines	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) Emitted interference FCC Part 15 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.

Functions and Features

The following table gives an overview of the important functional and performance characteristics of the RC 12BP+.

Table 1-3. Functions and features

Component / Function	Description / Features
Structure / Housing	Galvanized and powder coated high-strength steel chassis and guard-ring
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
Acceleration / braking profiles	11 acceleration and 11 braking curves
Imbalance detection	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 RC 12BP+. This data is to be taken into consideration when selecting the mains connection socket.

Table 1-4. Electrical connection data of the RC 12BP+

Cat.	Mains voltage	Frequency	Rated current	Power consumption	Equipment fuse	Building fuse	Supply Power Plugs
75007030	208-220V	60Hz	24 A	4400 W	25A & 6A	30 A	NEMA 6-30P SinglePhase
75007031	230V	60Hz	22.5 A	4500 W	25A & 6A	30 A	NEMA 6-30P SinglePhase
75007032	220V-230V	50Hz	24 A	4900 W	25A & 6A	32A	IEC60309 CEE 32 A-6h 1P+N+PE
75007033	230V/ 400V3~	50Hz	23.5 A	4370 W	25A & 6A	3x 32A	IEC60309 CEE 32 A-6h 3P+N+PE

Rotor Selection

The RC 12BP+ is supplied without a rotor.

Various rotors are available to choose from.

H12000 Blood bag rotor	77050
H12000 Bio rotor	77080

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.thermo.com>

Before use

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- “Aligning the Centrifuge” on page 2-5
- “Transporting the Centrifuge” on page 2-5
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- “Storage” on page 2-6

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.

Location

The centrifuge should only be operated indoors.

The set-up location must fulfil 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.
- 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.

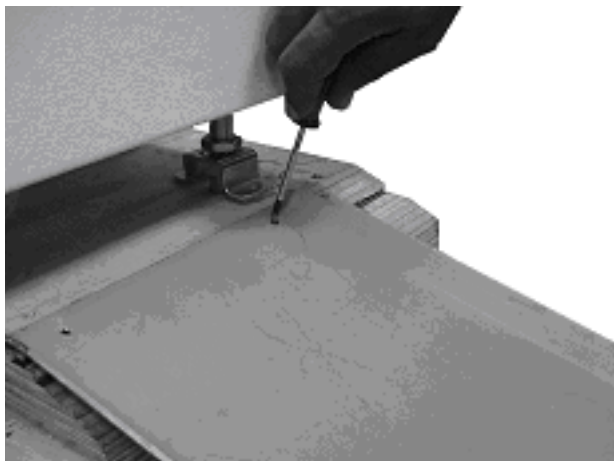
Installation



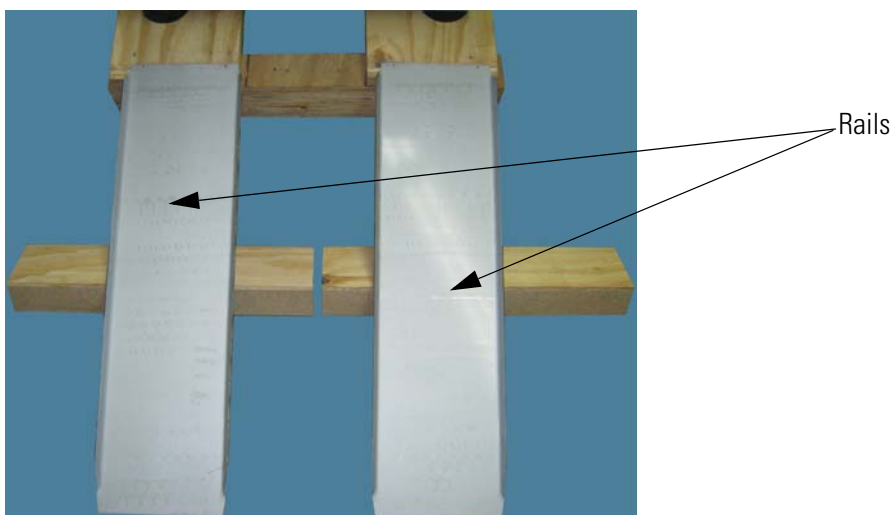
WARNING The centrifuge operates with high kinetic energies. Do not run the centrifuge without a radius of at least 30 cm (12 inch) around the centrifuge.
Do not run the centrifuge while standing on its casters.

Note The centrifuge is screwed onto the pallet with four screws.

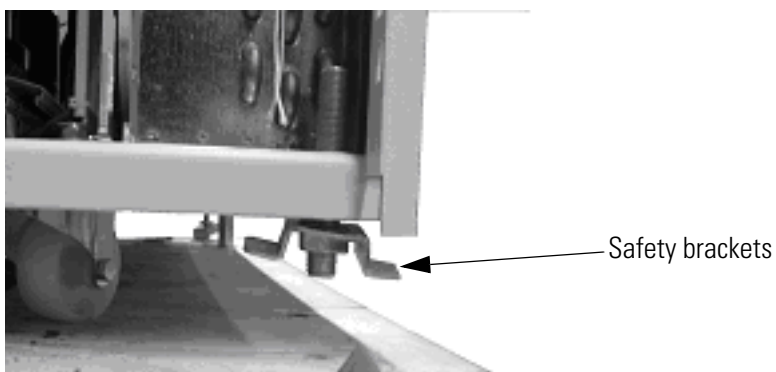
1. Place the pallet with the centrifuge so that you have at least 2 m room in front of the pallet.
2. Release the rails from the pallet.
3. Screw the rails onto the pallet in front of the centrifuge.



4. Place the piece of wood under the rails.



5. Place the rubber feet under the studs with the safety brackets and screw them entirely up.
6. Remove the four screws that fix the centrifuge to the pallet. The heads are upside down in the pallet.
7. Remove the bolt spacers.
8. Screw the studs with the safety brackets entirely up. Otherwise they might get stuck when rolling the centrifuge off the pallet.
9. Remove the rubber feet.

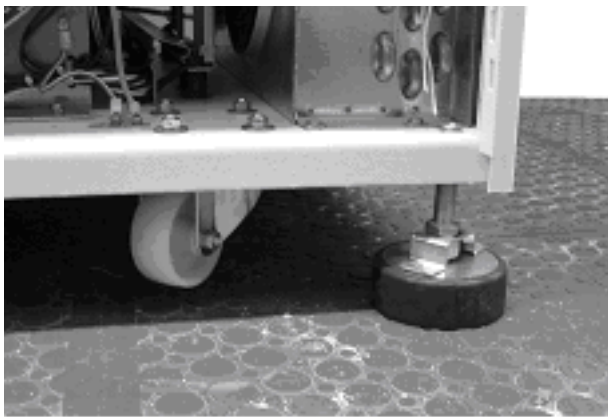


10. Check that the steering casters point to the back.
11. Use several people and other means in order to roll the centrifuge off the pallet.



WARNING Due to the centrifuges weight it must be controlled by several people and other means when rolling of the pallet. Do not stand in front of the centrifuge when rolling down for the centrifuge might run you over.

12. Once the centrifuge is in its final position mount the enclosed locking stabilizers.
13. Screw the studs down.
14. Place the rubber feet centrally and align the centrifuge. All the rubber feet should carry uniformly (check by a tilt test). The casters are at a distance of about 5-15 mm from the ground.



15. Switch on the centrifuge.
16. Open the centrifuge.
17. Put the enclosed water level on the drive spindle.
18. Use a wrench to rotate the safety brackets alternately to raise or lower them until the centrifuge is leveled.



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.

19. Remove the water level when the centrifuge is leveled.
20. Be sure that the four locking stabilizers stand safe and don't jolt. The final assembly of the safety brackets is carried out after leveling.
21. Tighten the locking nuts of the locking stabilizers firmly.
Mount the safety brackets by means of an 8 mm open-end wrench on the stabilizers.
22. Optional: To be certain the centrifuge is working properly, refer to the Customer Control Inspection paragraph located in "[Customer Control Inspection](#)" on [page 5-1](#). Perform the procedures listed under Speed Control, Timer, and Temperature Control.

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.

Transporting the Centrifuge

- Use a forklift to lift the centrifuge.
- The centrifuge can be damaged by impacts.
- Transport the centrifuge upright and if at all possible in packaging.

Note The packaging is an one-way packaging. Assign a logistic company for the transport. Contact Customer Service.



WARNING Always remove the rotor before moving the centrifuge.

Mains Connection

1. Turn off the power supply switch located on a small recessed panel in the upper right corner of the front cabinet panel (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.

Other connections

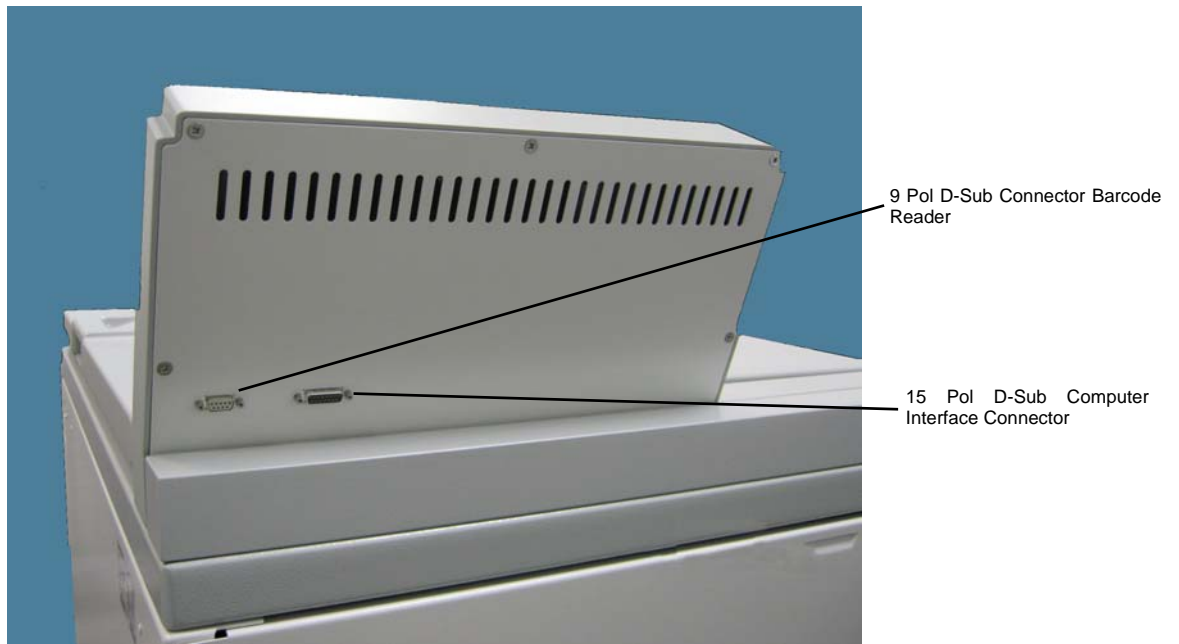


Figure 2-1. Connectors to external devices

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.

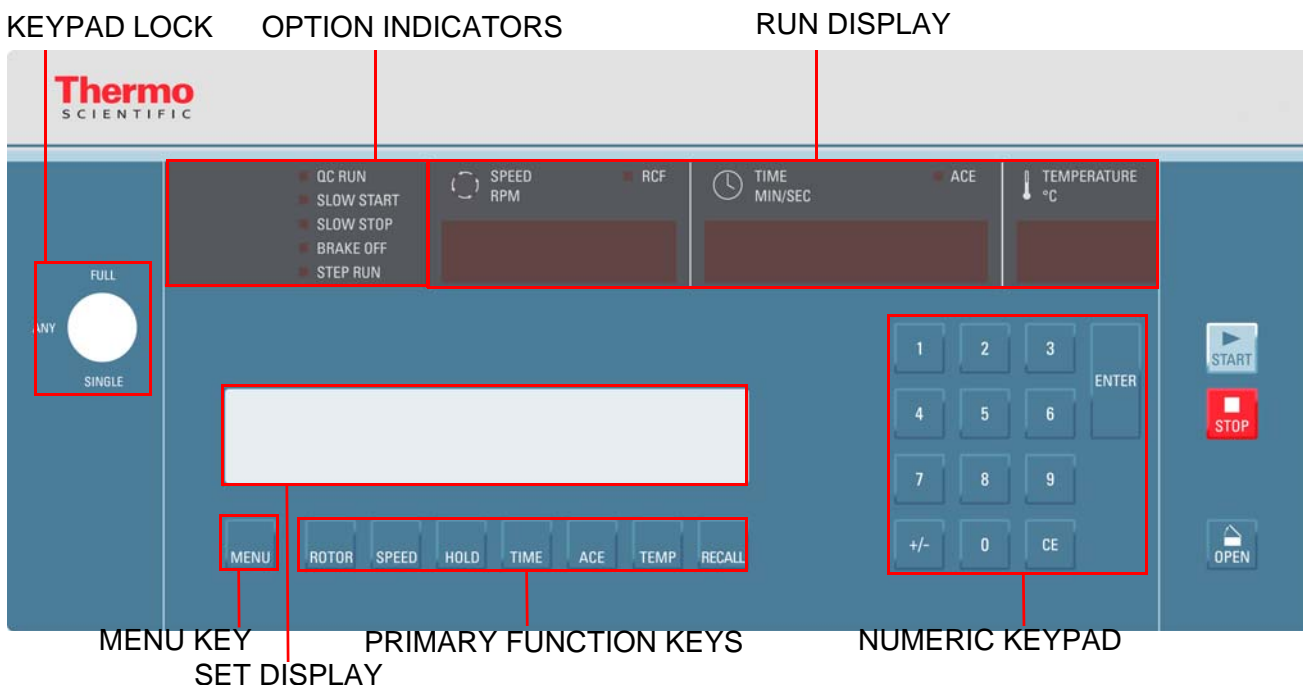
Control Panel

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- “KEYPAD LOCK” on page 3-8

CONTROLL PANEL

The controll panel consists of the RUN DISPLAY, the SET DISPLAY, the MENU key with the OPTION INDICATORS, the PRIMARY FUNCTION KEYS, a NUMERIC KEY PAD, and a KEYPAD LOCK.



KEYS

Press the START key to start a run.

Press the STOP key to stop a run.

Press the OPEN key to open the door. The key can only be used under the following conditions: The centrifuge is switched on. The rotor is not spinning. There is now error message in the display. The message OPEN appears in the RUN DISPLAY.

Press the ENTER key to confirm a selection. Or to step through the menu.

Use the numeric keypad to enter values into the SET DISPLAY. CLEAR removes input values or messages from the SET DISPLAY. +/- toggles between positive and negative temperature values.

Press the ROTOR key to enter the rotor selection.

Press the SPEED key to enter the speed or RCF selection.

Press HOLD key to select a continuous run.

Press TIME key to enter the time selection.

Press ACE key to enter ACE value.

Press TEMP key to enter the temperature.

Press RECALL to view and select programmed parameters.

Press MENU to enter advanced features.

RUN DISPLAY

The RUN DISPLAY shows the actual values during a run.

SPEED field

The SPEED (RPM/RCF) field indicates either:

- the current measured rotor speed (in rpm) or,
- the relative centrifugal force (or g-force) that is currently being generated at the maximum radius of the selected rotor if RCF is selected (RCF indicator is lit).
- At run completion (zero speed) the display shows the word "End" until the door is opened.

TEMPERATURE field

The run TEMPERATURE (°C) field indicates the current calculated sample temperature in degrees Celsius, based on:

- rotor selected,
- rotor speed,
- run time,
- set temperature, and
- measured temperature.

The calculation assumes that the sample temperature, rotor temperature, and SET temperature are all equal at the start of the run.

TIME field

The run time can be defined as follows:

You can select TIME/HOLD/ACE mode for a time controlled run.

- If controlled by TIME, the display counts down from set time, showing the time remaining (in minutes and seconds) until the run terminates and deceleration begins.
- If controlled by HOLD (indicated in the smaller SET DISPLAY below), the display during a run counts up. The RUN DISPLAY shows the time elapsed (expressed in minutes and seconds, up to a maximum of 99:59) since START was pressed.
- If controlled by ACE (Accumulated Centrifugal Effect™, ACE indicator lit), the RUN display shows the current Calculated ACE value ($\int \omega^2 dt$). When the set ACE value is reached, the run terminates and decelerates to a stop. The displayed value continues to calculate the centrifugal effect during deceleration to zero to show total accumulation.

PRIMARY FUNCTION KEYS

The Primary Function keys are the keys below the SET DISPLAY.

ROTOR allows selection of rotors to be used.

SPEED allows changing desired speed (rpm) or RCF (g-force).

TEMP allows changing desired calculated sample temperature.

RECALL allows viewing and selecting programmed parameters.

Each key is positioned below a corresponding field in the SET DISPLAY, allowing simple, direct access to basic run parameter controls:

ROTOR

- Press the ROTOR key to specify a different rotor than the one shown in the SET DISPLAY. This is necessary if the rotor or bucket/ carrier system installed in the centrifuge are changed.
- The rotors are listed by the rotor name. Press the ROTOR key repeatably to scroll through the rotor list for selection.
- The correct identification of the installed rotor is necessary for the set SPEED limits, correctly calculate RCF, and accurately control sample temperature.
- If a rotor is able to use buckets/carriers with different maximum radii, each configuration will be listed for selection, to calculate the different RCF.
- The ROTOR key is not active when a run is in progress.

Note To ensure that the installed rotor will always be correctly identified, make it a practice to change the SET rotor name immediately after changing the installed rotor.

SPEED

- Press the SPEED key to specify a different rotor speed in revolutions per minute (rpm) or relative centrifugal force (RCF, also known as g-force).
- Speed is selectable from 300 to 4700 rpm, up to the maximum rated speed for the specified rotor, or as an equivalent RCF calculated at the maximum radius of the specified rotor (rotor geometry only; with no accounting for adapters).
- Press the SPEED key repeatedly to toggle between rpm and RCF or RCF. Pressing once causes the value to flash so a change can be made in that mode. Pressing again changes to the other mode and displays a value equivalent to the previous. Pressing again causes that value to flash so a change can be made, pressing again changes the mode back, and so on.
- An entered value will continue to flash (prompting input) when it is out of range for the SET rotor. The formula used to calculate RCF is:

$$\text{RCF} = 11.18 \times \text{radius in cm} \times \left(\frac{\text{rpm}}{1000}\right)^2$$

Note When changing mode, rpm/RCF values may appear a digit or two off from the original set value. The centrifuge translates set RCF values to rpm whole numbers for speed control purposes, then calculates that rpm whole number to the closest RCF value. There is no cause for concern; speed control accuracy is not compromised, and the slight value difference will not affect your run

The run duration (from start to termination, when deceleration begins) setting or control method is changed by pressing one of these three PRIMARY FUNCTION KEYS:

TIME

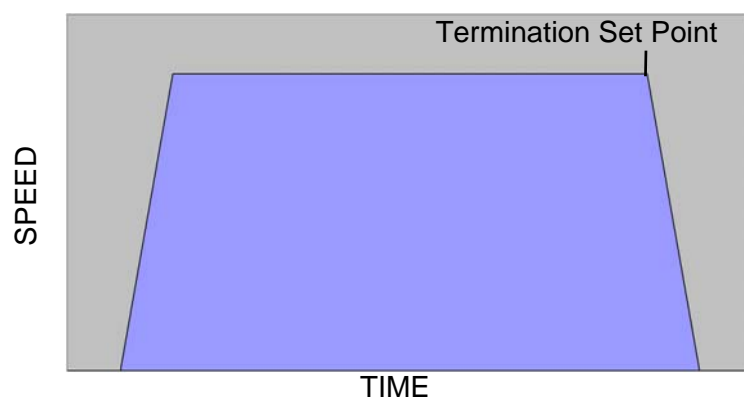
- Press the TIME key to specify a length of time (minutes and seconds, to a maximum of 99:59) from run start to termination.
- In the RUN DISPLAY, minutes and seconds begin counting down from the input value when START is pressed.
- The run terminates and deceleration begins when the timer reaches zero.

HOLD

- Press the HOLD key to specify a continuous run which, once started, runs until STOP is pressed (terminating the run and initiating deceleration).
- During a continuous run, HOLD will be in the SET DISPLAY, and the time elapsed from when START was pressed will appear in the RUN display.
- The timer will accumulate up to 99 minutes 59 seconds - if a run continues beyond that, the displayed run time will remain fixed at 99:59. Whenever it is possible for such an extended run to occur, an external timing method is recommended.

ACE

- Press the ACE key to specify an Accumulated Centrifugal Effect™ value.
- When ACE control is selected, the centrifuge calculates the effect of speed in relation to time (the shaded area in the illustration below), adjusting run duration to account for acceleration variation. This variation can be attributed to rotor load/configuration differences (affecting inertia), fluctuations in line voltage (affecting motor power), or slight mechanical differences including normal wear.



- When START is pressed, the realized ACE value begins to accumulate in the RUN DISPLAY.
- The run will terminate and deceleration will begin when the specified ACE value (expressed as $\omega^2 dt^1$ value up to 9.99×10^{30} [displayed as 9.99e30]) is reached.
- After termination, the RUN DISPLAY will continue to accumulate until the rotor stops - this run total is for reference; care should be taken not to confuse the RUN DISPLAY's final accumulation with the controlling input/ timeout value, found in the SET DISPLAY.
- Compared to control by time, ACE selection provides a more advanced and relevant form of run duration control, thereby improving separation consistency, run reproducibility, and dependability of results.
- During a run, to view in an alternative duration control mode (for example, to monitor accumulating TIME when an ACE run is in progress), press one of the other two duration control keys once - this changes the RUN DISPLAY to show an accumulating value in that alternative mode without altering the way duration is controlled. In this viewing condition, the SET DISPLAY field header does not change, nor will the status of the ACE indicator (both continuing to indicate the set control mode), but the SET value will change to show the last value entered in the alternative mode. If you press the same key a second time, the run will then change to that control method, using the value that was in the SET DISPLAY as the controlling value until a different one is entered.

Note If you change the duration control mode to TIME during a run, time begin to will count down from the set value the moment the change is made (unless the run was previously controlled by time, in which case the run will resume counting down from the value that existed when the TIME mode was exited). If you change mode to ACE control, the set value that exists at the moment the change is made will control run termination. If you change to ACE after the run has exceeded the set value, the run will terminate immediately.

- Between runs, the RUN DISPLAY shows the previous run duration values. You can choose each control mode.
- Press the TIME key to see the MIN:SEC value at termination (the SET DISPLAY shows the last TIME input value).
- Press the HOLD key to see the total MIN:SEC value after deceleration to zero.
- Press the ACE key to see the total ACE of an ACE controlled run. value after deceleration to zero (the termination value is in the SET DISPLAY). If the previous run was not controlled by ACE, pressing ACE shows the ACE value at termination (the SET DISPLAY shows the last ACE input value).
- Always be sure of the control method and value before pressing START.

¹The integral value can be calculated deriving the following formula:
$$\int \omega^2 dt = \omega^2 \int dt = \omega^2 \Delta t$$

Where Δt = Change in time (seconds)
and ω^2 = Angular speed
= $2\pi[n/60]$
n = Speed (rpm)

TEMP

Press the TEMP key to change the desired calculated sample temperature (°C) that is controlled by the centrifuge during a run.

The centrifuge automatically considers the rotor selected, rotor speed, run time, set temperature, and measured temperature to calculate and maintain sample temperature during the run. The calculation assumes that the sample temperature, rotor assembly temperature, and SET temperature are all equal at the start of the run (as they must be any time that temperature control is critical).

RECALL

- Press the RECALL key to access program memory.
- Saved parameters are recalled by inputting a specific program number. Press the START key to begin a run using the run parameters displayed.
- Programs can easily be recalled and modified to create new run parameters without fear of damaging the original program, because information that is saved in memory cannot be overwritten by using the RECALL key (modifying or replacing a program is reserved for the SELECT SAVE RUN option under the MENU key).

MENU and OPTION INDICATORS

- The MENU key accesses advanced feature options listed below it, plus other features such as saving parameters to memory.
- Pressing the MENU key to enter the advanced features. After that pressing 1 accesses a secondary screen to view or enter values, plus confirm option selection; pressing 0 deselects options; pressing ENTER steps through options without changing selections or settings, and on secondary screens, enters values to select the option. Pressing MENU again exits the options and returns to the SET DISPLAY without entering/selecting a flashing value.

SET DISPLAY

The SET DISPLAY is used to:

- input and display basic run parameters,
- to select options or other advanced features, and
- to display advisory messages.
- The SET DISPLAY displays currently selected values for the basic run parameters: ROTOR, SPEED/RCF, TIMED/HOLD/ACE, DEG C and, if displaying a recalled program, PROG #.
- The set values appear in the SET DISPLAY after the centrifuge power has been set ON and the diagnostic test has been completed.
- If you have pressed MENU to access the options screens, pressing MENU again will return the set values to the SET DISPLAY.
- The SET DISPLAY is the primary interactive screen on the control panel, and has a role in all aspects of centrifuge use.

KEYPAD LOCK

- The KEYPAD LOCK can be used to limit control panel function.
- It uses a 3-position keyswitch with a key that is removable in any of the 3 positions. Functionality is as follows:
 - The upper position, FULL (full function), allows use of all keys and features, without restriction;
 - The lower position, SINGLE (Run Single Program), minimizes functionality so that set parameters cannot be changed (START, STOP, and CLEAR are the only active keys);
 - The middle position, ANY (Run Any Program), makes it so that users may only perform runs using run parameters recalled from program memory (only RECALL, the numeric keypad including ENTER and CLEAR, START and STOP are active).
- Use of the KEYPAD LOCK may offer a considerable advantage, improving process control by reducing the possibility for operator error, as well as restricting unauthorized run parameter or program memory changes.

Operation

Contents

- “Switch on Centrifuge” on page 4-2
- “Lid Opening” on page 4-2
- “Close Lid” on page 4-2
- “Rotor Installation” on page 4-3
- “Normal Operation” on page 4-3
- “Centrifugation” on page 4-5
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- “Temperature Control” on page 4-13
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Switch on Centrifuge

Note Make sure the centrifuge is properly installed before turning it ON for the first time, (see Chapter 2, Installation).

1. Turn on the power switch located on a small recessed panel in the upper right corner of the front cabinet panel into position “1”.
The device performs a self-check of its software.
2. Watch the control panel LEDs to be sure that all segments light.

Note If any LED segments do not light, note which ones and inform Customer Service. Continued operation when the centrifuge is unable to display all run information correctly could mislead an unaware observer.

During start-up the SET DISPLAY shows:

```
THERMO SCIENTIFIC CENTRIFUGES  
Software selftest...
```

- If an error is detected, an error message will appear in the SET DISPLAY.
- If no error is found, the SET DISPLAY will display the values that was displayed when the centrifuge was turned OFF.
- All OPTIONS selections will also be the same as when the centrifuge was turned OFF.

Lid Opening

1. Press the "OPEN" 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 “Failure message” on page 7-3).

Close Lid

Close the lid by pressing down on it lightly in the middle or on both sides of it. Two locks close the lid completely. The lid will close automatically.



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

Note The lid should audibly click into place.

Door Gas Springs

Periodically check that the two door gas springs are functioning properly.

- a. Open the chamber door and making sure it remains open.
The gas springs counterbalance the weight of the door and hold it in the open position.
If the chamber door will not stay in the open position, inform Customer Service.
- b. Check that the gas spring bracket is not cracked.
If the gas spring bracket is cracked, inform Customer Service.



CAUTION The door gas springs must be checked periodically for proper functioning. If gas pressure is not sufficient the door will not stay open and possible injury could result.

Rotor Installation

The approved rotors for the centrifuge are listed in section “Rotor Selection” on page 1-5. 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.

Proceed as follows:

1. Open the lid of the centrifuge and if necessary remove any dust, foreign objects or residue from the chamber.
2. Follow the instructions given in the rotor manual in order to install, load, and balance the rotor.
3. Close the centrifuge lid.
4. Make sure the rotor matches the rotor in the SET DISPLAY.
5. Press the ROTOR key repeatedly until the name of the installed rotor appears.

Normal Operation

Preselecting Speed / RCF

1. Press the SPEED key.
The display shows the RPM or the RCF-value depending on the display setting. Press the SPEED key to toggle between the two modes.
2. Enter the desired value using the numeric pad.
The digits show in sequential order.

Note If you select a value that is too high for the defined rotor it will not be accepted. The value will continue to blink.

3. Confirm your entry by pressing ENTER.
Your entry will also be automatically confirmed if you do not press any key for 5 seconds.

Note The equivalent value will be calculated and displayed. 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 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:

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

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.

Preselecting Run time

1. Press the TIME key in order to open the runtime selection menu.
2. Enter the desired runtime using the numeric pad.
The maximum selectable run time is 99:59.
The digits show in sequential order.
3. Confirm your entry by pressing ENTER.
Your entry will be automatically confirmed if you do not press any key for 5 seconds.

ACE

1. Press the ACE key in order to open the ACE selection menu.
2. Enter the desired runtime using the numeric pad.
The maximum selectable ACE is 9.99×10^{30} (read 9.99e30 in SET DISPLAY)
The digits show in sequential order.
3. Confirm your entry by pressing ENTER.
Your entry will be automatically confirmed if you do not press any key for 5 seconds.

HOLD

Press the HOLD key in order to select the HOLD run. During HOLD, the centrifuge will continue running until you stop it manually with the STOP key.

Preselecting temperature

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

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

Centrifugation

Once the rotor has been properly installed, the main switch has been turned on and the door has been closed, you can start centrifugation

Starting centrifuge program

1. Press the START key on the control panel.
The centrifuge accelerates to the pre-set speed with the time display active.
2. You cannot open the door while the centrifuge is running.

Imbalance indicator

If a load is imbalanced, this will be indicated by the message "ROTOR IMBALANCE - BALANCE ROTOR".

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

Set 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 SPEED field. By pressing the OPEN key, you can open the lid and remove the centrifuge material.

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

ACE

When you select an ACE control run, the run will determine when the centrifuge has reached the set ACE value.

HOLD

If you selected continuous operation (see “HOLD” on page 4-4), you will have to stop the centrifuge manually. Press the STOP key on the control panel. The centrifuge will be decelerated at the designated rate. The message "END" will illuminate, and after pressing the key OPEN, the lid will open and you can remove the samples.

Programmed Operation

Storing Selections to Program Memory

1. Establish all desired run parameters as explained above, “Normal Operation” on page 4-3.

Note If you plan on using the QC RUN feature, consider the following as you save runs to program memory:

- QC programs should all apply to using the same rotor.
- QC RUN programs should not use HOLD.

To minimize the time it takes to perform a QC RUN, we recommend the following:

- Starting with program 1, save runs to program memory: first by temperature (highest first), then, by speed (lowest first).

FOR EXAMPLE: The programs below are listed in correct order for using QC RUN function (program values shown are for example purposes only, actual set parameters will vary).

ROTOR	SPEED	TIMED	DEG C	PROG #
H-12000	2900	04:00	22	1
H-12000	4000	03:00	22	2
H-12000	3800	03:45	4	3
H-12000	4700	05:30	4	4

2. Press the MENU key to access the advanced features screens.
3. Press the ENTER key (six times after first accessing the advanced features) until the following screen is in the SET DISPLAY:

```
SAVE TO PROGRAM MEMORY?  
(1=YES, 0 or ENTER=NO)
```

4. Press 1.

The following screen will appear in the SET DISPLAY:

```
ENTER PROGRAM NUMBER:  
(SINGLE RUNS, 1-9; STEP RUNS, 10-15)
```

Note Single-digit program numbers 1-9 are for storing sets of standard run parameters; double-digit program numbers 10-15 are for storing step-runs.

5. Enter a program number.
6. Press ENTER key.
The SET DISPLAY will then return to the HOME screen, and that program number will appear in the PROG # field as confirmation:

```

ROTOR SPEED TIMED DEG C PROG #
H12000 2800 4:00 22 1

```

7. Record saved information on the Program Log Pad (supplied).

Note To prevent accidental erasure of established programs, if the entered program number has been previously assigned, the following message will appear:

```

PROGRAM IN USE - OVERWRITE?
(1=YES, 0 or ENTER=NO)

```

To review stored programs before overwriting, refer to your Program Log Pad or press RECALL. If you press RECALL, you will have to go back and re-establish the run parameters before you can store them to memory.

Performing a Programmed Run

Read the Safety Information Page at the front of this manual.

1. Press RECALL .
The SET DISPLAY will change to display a program number flashing in the PROG # field.
2. Input the desired program number, then press ENTER key.
The SET DISPLAY and options indicators change to reflect the run parameters that were saved to that program number.
3. Prepare the rotor according to the rotor manual.
4. Open the chamber door and install the rotor, making sure that the rotor is fully seated and locked to the drive spindle. Install the rotor cover, if any, then close the chamber door.

Note Rotor names are saved within the program. If the rotor is changed by selecting a different program this will be indicated in the SET DISPLAY. Be sure that the installed rotor is correct for the recalled program. Make sure that the SET rotor identifies the installed rotor.

5. If using logging software, make sure it is running, then press START key.

The rotor will accelerate according to the recalled parameters, and continue until run termination. At termination, the rotor will decelerate to a stop. After it stops "End" will appear in the SPEED display and remains there until the door is opened or the START key will be pressed.

Note If you select a program number that has not been used to save a program, a warning message will be displayed. In this case no program will be recalled.

Using Advanced Features (Options)

The advanced features of the centrifuge allow for:

- performing quality control runs, changing speed or time control ranges,
- changing acceleration/deceleration or overtemperature alert settings,
- linking together programmed run parameters, and
- saving run parameters to program memory for simple recall.

Advanced feature selection is usually reflected by LED option status indicators. When a feature has been selected, the corresponding indicator will be lit (although specific settings for several features can only be checked by reselecting the feature in the options screens). If changes to advanced feature selection are required (other than to RPM/RCF or TIME/HOLD/ACE status, which are accessible through primary function keys). The features are accessed by pressing MENU and then pressing ENTER until the selection screen of the particular feature appears in the SET DISPLAY.

- The MENU key accesses advanced feature options listed below it, plus other features such as saving parameters to memory.

Press the MENU key to enter the advanced features. After that pressing 1 accesses a secondary screen to view or enter values, plus confirm option selection. Pressing 0 deselects options. Pressing ENTER steps through options without changing selections or settings, and on secondary screens, enters values to select the option. Pressing MENU exits the options and returns to the SET DISPLAY without entering/selecting a flashing value.

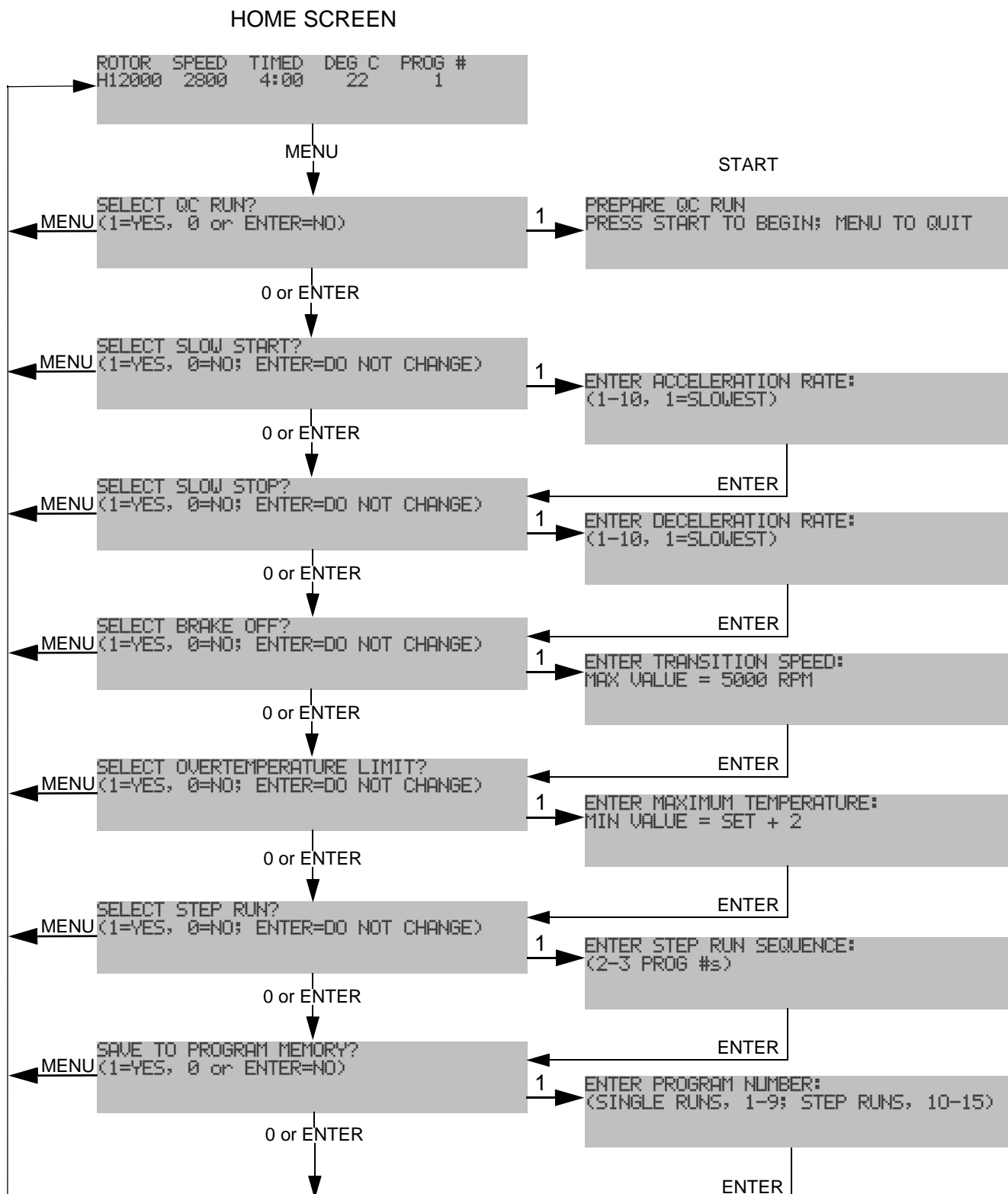


Figure 4-1. Advanced Feature Option Screens

SELECT QC RUN

- QC RUN allows simple, automatic quality control run speed/ temperature verification when used with the optional computer interface package. The QC RUN feature will run and document the data from each set of parameters that has been saved in program memory.
- When QC RUN is selected, the SET DISPLAY will prompt you to prepare for the run and press the START key to begin. The centrifuge will start running program number 1, and systematically run each program in-order through program number 9.
- While the QC RUN is in progress, the parameters of the program that is running will be in the SET DISPLAY.
- During a QC RUN the centrifuge checks if the preset speed and temperature can be reached. In order to save time during the QC RUN the next program will be run once the desired speed has been reached and the temperature is within ± 2 °K of the preset value.

Note If you plan on using the QC RUN feature, consider the following as you save runs to program memory:

- QC programs should all apply to using the same rotor.
 - QC RUN programs should not use HOLD.
- To minimize the time it takes to perform a QC RUN, we recommend the following: Starting with program 1, save runs to program memory. Sort first by temperature (highest first), then, if there is more than one run at a single temperature, by speed (lowest first).
FOR EXAMPLE: The programs below are listed in correct order for using QC RUN (program values shown are for example purposes only, actual set parameters will vary).

ROTOR	SPEED	TIMED	DEG °C	PROG #
H-12000	2900	04:00	22	1
H-12000	4000	03:00	22	2
H-12000	3800	03:45	4	3
H-12000	4700	05:30	4	4

To select the QC RUN feature:

1. Press MENU key .
 2. Input 1.
 3. Install the correct rotor.
 4. Press START key.
The QC RUN sequence will begin, running program number 1.
- If, during a QC RUN, the observed RUN temperature is more than 2°C over SET temperature, the rotor continues spinning until set temperature is reached.

SLOW START

- SLOW START chooses gentle acceleration from 0 to 250 rpm (acceleration transitions to the normal, maximum rate at 250 rpm), with the slow start rate defined by selection of one of ten different acceleration profiles.
- The profiles are numbered for ease of selection, with number 1 being the slowest, most gradual rate, and each successive rate being incrementally faster up to number 10.
- If SLOW START is selected when START is pressed, the rotor will accelerate at a more gradual rate.
- After SLOW START selections are completed, SELECT SLOW STOP? will appear in the SET DISPLAY.

SLOW STOP

- SLOW STOP chooses gentle deceleration from 500 to 0 rpm (normal deceleration braking from set speed transitions to the more gradual rate at 500 rpm), with the rate defined by selection of one of ten different deceleration profiles.
- The profiles are numbered for ease of selection, with number 1 being the slowest, most gradual rate, and each successive rate incorporating incrementally more braking up to number 10.
- Selection of BRAKE OFF will have an affect on SLOW STOP (see the NOTE under BRAKE OFF).

BRAKE OFF

- BRAKE OFF deactivates normal deceleration braking for a coasting stop from any specified speed (in rpm).
- The time it takes for the rotor to stop depends on the transition speed, windage and inertia of the rotor.
- BRAKE OFF transition speed is set independently of set run speed, and is not affected by changes to set run speed. If the transition speed is set higher than the set run speed, at run termination, the centrifuge will coast to a stop from set speed.

Note If SLOW STOP and BRAKE OFF are both selected:

- If the BRAKE OFF transition speed is set to 500 rpm or higher, the SLOW STOP selection will be ignored.
 - If the BRAKE OFF transition speed is set below 500 rpm, the centrifuge will decelerate with full braking to 500, transition to the specified SLOW STOP rate, then change to a coasting stop when the specified BRAKE OFF transition speed is reached.
- After BRAKE OFF selections are completed, CHANGE OVERTEMPERATURE LIMIT? will appear in the SET DISPLAY.

CHANGE OVERTEMPERATURE LIMIT

- CHANGE OVERTEMPERATURE LIMIT allows changing the maximum allowable sample temperature to establish a new overtemperature offset value.
- The centrifuge calculates the difference between the set and the maximum temperatures, and retains that value as an offset to apply to future runs, until it is changed. The retained offset will apply to any normal (manual entry) run.
- Recalling program runs may change the overtemperature limit. Specific overtemperature limit settings can be saved in run programs. See the EXAMPLE:
EXAMPLE: If you have a set temperature of 22°C and set the maximum temperature to 24°C, an overtemperature alert will occur if the calculated sample temperature reaches 25°C. If the set temperature is then changed to 4°C, the maximum temperature setting will automatically change to 6°C.
- During a run, if the calculated sample temperature in the RUN display goes above the maximum allowable sample temperature, the run will terminate, a SAMPLE TEMPERATURE OVER LIMIT message will appear in the SET DISPLAY, and an alarm will sound. This may indicate a condition requiring simple corrective action, or it could indicate a refrigeration problem (“SAMPLE TEMPERATURE OVER LIMIT” on page 7-3).
- Overtemperature termination is deactivated when a temperature change between programs occurs in a QC RUN. The QC RUN is repeated until the temperature is within 2°C of set temperature.
- After CHANGE OVERTEMPERATURE LIMIT selections are completed, SELECT STEP RUN? will appear in the SET DISPLAY.

STEP RUN

- STEP RUN allows the linking-together of up to three sets of programmed run parameters to automatically perform step run protocols.
- If the desired parameters have not been entered into memory, you must save each desired set of parameters to memory before continuing with step run creation.
- If programs are used within a step run, that have not been defined before, a warning message will be displayed.
- To create a step run, input a program number 1-9 for the first portion of the step run.
- The SET DISPLAY will prompt for another number, input a program number 1-9 for the second portion of the step run.
- The SET DISPLAY will prompt for another number, and you can either press ENTER (if you are creating a two-stage step run), or input a program number 1-9 for the third portion of your run.

Note When step run is selected, the specified programs must specify the same rotor at similar temperatures

- Step runs can be saved to program memory (program numbers 10-15) for simple recall in future use (see SAVE RUN below).
- Runs are not inadvertently corrupted, whenever STEP RUN has been selected (indicator lit).

- Changes to run parameters will be ignored unless STEP RUN is deselected before START is pressed.
- The only changes that could be made without deselecting would be if a different step run was recalled from program memory (program numbers 10-15).
- After STEP RUN selections are completed, SAVE TO PROGRAM MEMORY? will appear in the SET DISPLAY.

SAVE TO PROGRAM MEMORY?

- SAVE RUN allows pre-programming of up to 15 different sets of run parameters (9 standard runs, and 6 step runs) for future simple recall and error-free run reproducibility.
- In addition to basic parameters, all option selections and settings (excluding rotor name and overtemperature limit) will also be saved to program memory.
- To eliminate inadvertent loss of existing programs, the save run sequence alerts users before overwriting.
- The RECALL key allows browsing through existing programs for selection or reference.

Note If you plan to use the QC RUN feature, specific guidelines should be considered when saving parameters to memory.

- To save a run, all run parameter selections should be made before selecting this option.
- After SAVE RUN selection and assignment of a program number, the SET DISPLAY will return to the HOME screen.

Temperature Control

The centrifuge controls calculated sample temperature during a run based on the rotor selected, rotor speed, run time, SET temperature and measured chamber temperature. The complex calculation the centrifuge performs must assume, however, that the sample and the rotor are at SET temperature at the start of the run. If temperatures are not equilibrated, adjustments made by the centrifuge's control system may not be appropriate (although, over time, temperature control should come into range).

Note When temperature control is critical, the sample, SET temperature, rotor (body, buckets, adapters, and cover), and rotor chamber should all be at the same temperature when START is pressed. Also, remove the sample soon after a run has ended, so that it will not be affected if chamber temperature drops slightly when the rotor is no longer generating heat due to air friction.

Either store the rotor in a controlled temperature environment (such as refrigerator or cold room), or precool/preheat the rotor in the centrifuge chamber, until the rotor is the same temperature as the sample and the required SET temperature.

Temperature control needs can vary with the application. In many cases, the centrifuge will be used to run large volumes of sample for short amounts of time. With such a run, if all components have been equilibrated, it would be difficult to significantly change sample temperature during the run - even if the centrifuge's temperature control performance was reduced.

Rotor Temperature Equilibration

To equilibrate the rotor temperature in the centrifuge chamber:

1. Install the rotor in the rotor chamber, place empty buckets (if applicable) in all positions, and the rotor cover, if any.
2. Close the door.
3. Turn off all options (access with MENU key).
4. Check to be sure the correct rotor name is in the ROTOR field of the SET DISPLAY. If not, press ROTOR until it is.
5. Press SPEED. If cooling, input 1500 rpm. If heating, input a value that is approximately 70% of the maximum rated speed of the selected rotor.
6. Press HOLD to select a continuous run.
7. Press TEMP and enter the desired temperature.
8. Press START to begin temperature equilibration.
9. The centrifuge will alert you that a sample overtemperature condition exists, and that pre-cooling is taking place. Press CLEAR.
10. Monitor progress of the value in the RUN TEMPERATURE display, and note the time when the displayed RUN temperature reaches the SET temperature. From the time it does, allow the run to continue for an additional 30 minutes, then press STOP.

Customer Control Inspection

Contents

- “Speed Controls” on page 5-2
- “Timer Controls” on page 5-2
- “Temperature Controls” on page 5-3

To keep your centrifuge in good working condition and ensure accurate test results, Thermo Fisher Scientific recommends that you check the speed controls, timer controls and temperature controls at least twice a year. If the bi-annual inspection reveals inaccurate results for any of these controls, inform Customer Service to recalibrate the controls.

Speed Controls

1. Prepare a sample of test fluid.
2. Load and balance the rotor according to the instructions in the rotor manual.
3. Install the rotor in the chamber.
4. Close the chamber door.
5. Set the run parameters for a commonly used protocol, with SPEED controlled by rpm, and run duration set to HOLD.
6. Deselect RCF or SLOW START if indicators are lit.
7. Press START key .
8. Wait for the SPEED value in the RUN display to reach the specified SET speed. Wait an additional 5 minutes for speed to stabilize.
9. Check rotor speed through the viewing port in the centrifuge door using a strobe tachometer (in rpm, following instructions supplied with the tachometer).
The tachometer should indicate rpm equal to the SET value $\pm 1\%$, (2000 rpm and below, ± 20 ; above 2000 rpm, $\pm 1\%$).
10. If necessary, repeat this procedure at other speeds that are commonly used in your protocols.

Timer Controls

1. Prepare a sample of test fluid.
2. Load and balance the rotor according to the instructions in the rotor manual.
3. Install the rotor in the chamber.
4. Close the chamber door.
5. Set the run parameters for a commonly used protocol, but set the run duration by TIME (MIN:SEC) to 10:00.
6. Press START key .
7. Using a stopwatch, begin timing precisely as the RUN TIME display counts down to 10:00. Then stop timing precisely as the RUN TIME display counts down to 00:00.
The stopwatch should read between 9:30 to 10:30, representing 10:00 $\pm 5\%$ (29 seconds) plus an additional second to allow for cumulative human error.
8. If necessary, repeat this procedure at other time ranges that are commonly used in your protocols.

Temperature Controls

When verifying temperature control, all test run conditions (TEMP, SPEED, TIME, ROTOR and option selections) should match your required protocol(s). Test fluid must be at the same volume and temperature as the actual sample (use a calibrated thermometer to confirm). The sample temperature, rotor assembly temperature, and SET temperature must match also. Ideally, all components would have been stored in the same controlled-temperature area overnight. If that is not possible, you can precool or preheat the rotor as required. Immediately after the test run is performed, check test fluid temperature using the same thermometer that was used before the run.

1. Set the run parameters. Choose the protocol with the longest run time.
2. Equilibrate the rotor chamber and the temperature of all rotor parts (include any tubes, bottles, or adapters to be used) to the desired sample temperature.
3. Prepare two equal loads of test fluid (similar in volume to normal run samples) equilibrated to the desired sample temperature. Check the sample temperature using a calibrated thermometer.

Note Test fluid must be compatible with aluminum and have a freezing point below the desired sample temperature.

4. Load and balance the rotor according to the instructions in the rotor manual.
5. Install the rotor in the chamber.
6. Close the chamber door.
7. Press START key.
During the run, the RUN display temperature should be within 2°C of the SET DISPLAY temperature.
8. Immediately after the run measure the sample temperature using the same calibrated thermometer used earlier.
The measured sample temperature should be within 2°C of SET temperature.
9. If required, repeat this procedure at any other speed/temperature ranges that are commonly used in your run protocols.
10. If an out-of-range temperature is observed, re-equilibrate the chamber, rotor, and test fluid temperatures to match desired sample temperature, and repeat the test run.

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

Cleaning Intervals

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

Maintenance	Recommended Interval
Clean rotor chamber	daily or when polluted
Clean rotor	daily or when polluted
Accessories	daily or when polluted
Cabinet	Once per month
Ventilation holes	Every six months



CAUTION Refrain from using any other cleaning or decontamination procedure than those recommended here, if you are not entirely sure that the intended procedure is safe for the equipment.

Use only approved cleansers.

If in doubt, contact Thermo Fisher Scientific.

Cleaning

When cleaning centrifuge and accessories:

- 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.

- The felt ring that seals the bearing openings must be fully soaked with oil to provide in a particular case a sufficient protection against leaking liquids.



CAUTION Observe that no liquids, particularly no organic solvents, get into the openings at the motor shaft outlet, as they could leach out the grease of the bearings.

Clean centrifuge and accessories as follows:

1. Open the centrifuge.
2. Turn off the centrifuge.
3. Pull out the power supply plug.
4. Remove the rotor according to the rotor manual.



CAUTION Lift the rotor with two persons due to its weight.

5. Remove the centrifuge tubes and adaptors.
 6. Use a neutral cleaning agent with a pH value between 6 and 8 for cleaning.
 7. Dry all of the rotors and accessories after cleaning with a cloth or in a warm air cabinet at a maximum temperature of 50°C.
 8. Clean the housing of the centrifuge as needed.
- After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (7000 9824). Also treat the cavities with oil.
 - Treat the bolts of the swing out rotor with bolt grease (75003786).



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

After some applications there might be ice in the rotor chamber.

To defrost the chamber:

1. Install a rotor and close the centrifuge.
2. Set run parameters to SPEED=2500 rpm, TIME=5:00 (longer for heavy frost buildup), TEMP=30.
3. Press the START key.

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. Remove the rotor according to the rotor manual.



CAUTION Lift the rotor with two persons due to its weight.

5. Remove the centrifuge tubes and adaptors and dispose of them or disinfect them.
6. Treat the rotor and accessories according to the instructions for the disinfectant. Adhere strictly to the given application times.
7. Be sure the disinfectant can drain off the rotor.
8. Rinse the rotor and rotor lid thoroughly with water and then rub down.
9. Dispose of the disinfectant according to the applicable guidelines.
10. Dry all of the rotors and accessories after cleaning with a cloth or in a warm air cabinet at a maximum temperature of 50°C.
 - After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (7000 9824). Also treat the cavities with oil.
 - Treat the bolts of the swing out rotor with bolt grease (75003786).

Decontamination

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



WARNING Radioactive material can get into the centrifuge when a tube breaks or as a result of spills. Keep in mind the risk of infection when touching the rotor and take all necessary precautions.
In case of contamination, make sure that others are not put at risk.
Decontaminate the affected parts immediately.
Take other precautions if need be.



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

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

Disinfect the rotor and accessories as follows:

1. Open the centrifuge.
2. Turn off the centrifuge.
3. Pull out the power supply plug.
4. Remove the rotor according to the rotor manul.



CAUTION Lift the rotor with two persons due to its weight.

5. Remove the centrifuge tubes and adaptors and dispose of them or disinfect them.
6. Rinse the rotor first with ethanol and then with de-ionized water.
 - Adhere strictly to the given application times.
7. Be sure the decontamination solution can drain off the rotor.
8. Rinse the rotor and accessories thoroughly with water.
9. Dispose of the decontamination solution according to the applicable guidelines.
10. Dry all of the rotors and accessorie after cleaning with a cloth or in a warm air cabinet at a maximum temperature of 50°C.
 - After cleaning, treat the entire surface of aluminum parts with corrosion protection oil (7000 9824). Also treat the cavities with oil.
 - Treat the bolts 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.

Clean the rotor before autoclaving and rinse it with distilled water. Remove all accessories (tubes, adapters). Place the rotor on a flat surface.

Note No chemical additives are permitted in the steam.



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

Service of Thermo Fisher Scientific

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

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

Thermo Fisher Scientific offers inspection and service contracts for this work.

Troubleshooting

Contents

- “Mechanical Emergency Door Release” on page 7-2
- “Circuit Breakers” on page 7-3
- “Failure message” on page 7-3

Mechanical Emergency Door 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 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. Unlock the front door by means of square box wrench.
4. Open the front door.
5. Pull down both levers on the right hand side.
The door lock will be release mechanical. The lid will open and the samples can be removed.

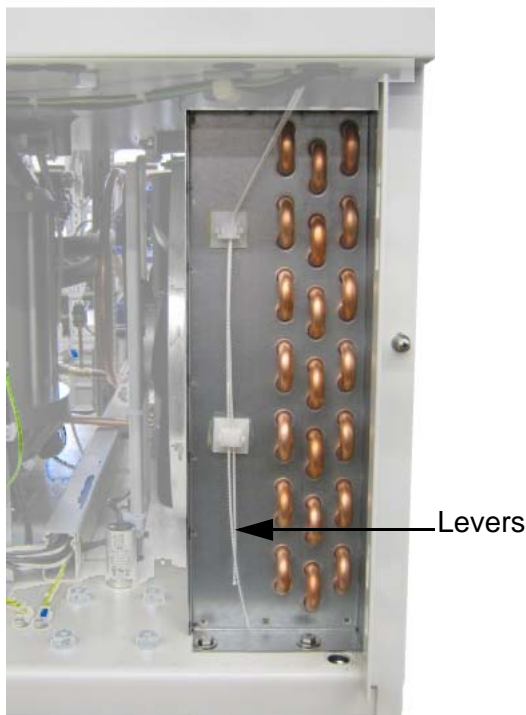


Figure 7-1. Emergency door release

6. Close the door and lock it well.

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

Circuit Breakers

The centrifuge has circuit breakers. In the event of a failure inform Customer Service.

Failure message



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
NO ROTOR DETECTED	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 Customer Service.
ROTOR IMBALANCE - BALANCE ROTOR	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 Customer Service.
CRITICAL OVERTEMP	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked. The run will not terminate	Turn off the centrifuge. Pull out the power supply plug. Inform Customer Service.
SAMPLE TEMPERATURE OVER LIMIT	The RUN DISPLAY temperature went above the maximum allowable (overtemperature limit) setting. The centrifuge cannot be operated.	<ul style="list-style-type: none"> The set temperature is too low for the selected speed. The selected maximum temperature is in the overtemperature limit. The permissible ambient temperature at the air inlet is >35 °C. The air inlet is blocked, the clearance is too small <30 cm. Check the aspects mentioned above. If an error message appears again, inform Customer Service.
AIR TEMP MEASURE ERROR	The centrifuge cannot be operated.	The cooling circuit is open. The temperature is >45 °C. Wait for the rotor to cool down in order to prevent burn. Turn off the centrifuge. Pull out the power supply plug. Inform Customer Service.

7 Troubleshooting

Failure message

Failure message	Problem with centrifuge	Possible causes and cures
AIR TEMP SENSOR FAIL	The centrifuge cannot be operated.	The temperature sensor detects a temperature increase $>10^{\circ}\text{C}$, while the centrifuge is cooled down. The cooling circuit is open. The temperature sensor is broken. Wait for the rotor to cool down in order to prevent burn. Turn off the centrifuge. Pull out the power supply plug. Inform Customer Service.
MISSING MEMORY CONTAINING CONFIGURATION	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The centrifuge did not find the NV RAM2 during self-testing. Restart the centrifuge. If an error message appears again, turn off the centrifuge. Pull out the power supply plug. Inform Customer Service.
DOOR CLOSED SWITCH FAILURE	The centrifuge cannot be operated. The centrifuge runs down without being braked.	The door lock opened during a run. Turn off the centrifuge. Pull out the power supply plug. Inform Customer Service.
DOOR LOCK SWITCH FAILURE	The centrifuge cannot be operated. The centrifuge runs down without being braked.	The door lock opened during a run. Turn off the centrifuge. Pull out the power supply plug. Inform Customer Service.
DOOR LOCK SWITCH SHORTED	Centrifuge does not open.	The power supply for the door lock is broken. The emergency lid release enables you to retrieve your samples. Turn off the centrifuge. Pull out the power supply plug. Inform Customer Service.
ROTOR NOT SPINNING	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. The emergency lid release enables you to retrieve your samples. Turn off the centrifuge. Pull out the power supply plug. Inform Customer Service.
MAIN CONTACT FAILURE	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The main fuse is not available. Restart the centrifuge. If an error message appears again, turn off the centrifuge. Pull out the power supply plug. The emergency lid release enables you to retrieve your samples. Inform Customer Service.

Failure message	Problem with centrifuge	Possible causes and cures
TACH FAULT DETECTED	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The tachometer signal is not available. The emergency lid release enables you to retrieve your samples. Turn off the centrifuge. Pull out the power supply plug. Inform Customer Service.
INTERNAL SYSTEM ERROR OCCURRED	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The microprocessor has detected erroneous information. Restart the centrifuge. If an error message appears again, turn of the centrifuge. Pull out the power supply plug. The emergency lid release enables you to retrieve your samples. Inform Customer Service.
ROTOR OVER MAX SPEED	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The speed is more than 200 rpm above the rotor's maximum rated speed. The emergency lid release enables you to retrieve your samples. Turn off the centrifuge. Pull out the power supply plug. Inform Customer Service.
MEMORY DATA NOT SUITABLE FOR INSTRUMENT	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The centrifuge detected during self-testing that the NV RAM2 does not match the processor. Restart the centrifuge. If an error message appears again, turn of the centrifuge. The emergency lid release enables you to retrieve your samples. Pull out the power supply plug. Inform Customer Service.
MEMORY NOT INITIALISED	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The centrifuge did not find the program memory during self-testing. Restart the centrifuge. If an error message appears again, turn of the centrifuge. The emergency lid release enables you to retrieve your samples. Pull out the power supply plug. Inform Customer Service.

7 Troubleshooting

Failure message

Failure message	Problem with centrifuge	Possible causes and cures
INTERNAL PROGRAM ERROR	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The centrifuge detected a program fault. Restart the centrifuge. If an error message appears again, turn of the centrifuge. The emergency lid release enables you to retrieve your samples. Pull out the power supply plug. Inform Customer Service.
FREQUENCY CONVERTER VOLTAGE TO HIGH	The centrifuge cannot be operated. The run does not start or the centrifuge runs down without being braked.	The line voltage exceeds the tolerance or failure of the braking resistance. Restart the centrifuge. If an error message appears again, turn of the centrifuge. The emergency lid release enables you to retrieve your samples. Pull out the power supply plug. Inform Customer Service.

Chemical Compatibility Chart

CHEMICAL	MATERIAL	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOP PAINT	COMPOSITE Carbon Fiber/Epoxy	DEIRIN®	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL®	NYLON	PET ¹ , POLYCLEAR®, CLEARCRIMP®, CCCLEARCRIMP®	POLYALLOMER	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	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	S	U
Allyl Alcohol	-	-	-	U	-	-	S	-	-	-	-	S	-	S	S	M	S	S	S	S	-	M	S	-	-	S	-	-
Aluminum Chloride	U	U	S	S	S	S	U	S	S	S	S	M	S	S	S	S	-	S	S	S	S	S	M	U	U	S	S	
Formic Acid (100%)	-	S	M	U	-	-	U	-	-	-	-	U	-	S	M	U	U	S	S	-	U	S	-	U	S	-	U	
Ammonium Acetate	S	S	U	-	S	S	S	-	S	S	S	S	S	S	S	U	-	S	S	S	S	S	S	S	S	S	S	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	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	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	

A Chemical Compatibility Chart

CHEMICAL	MATERIAL																											
	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN®	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL®	NYLON	PET ¹ , POLYCLEAR®, CLEARCRIMP®, CCCLEARCRIMP®	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®	
Cesium Acetate	M	-	S	-	S	S	S	-	S	S	S	S	-	S	S	-	-	S	S	S	S	S	S	M	S	S	S	
Cesium Bromide	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S	
Cesium Chloride	M	S	S	U	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S	
Cesium Formate	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S	
Cesium Iodide	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S	
Cesium Sulfate	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S	
Chloroform	U	U	U	U	S	S	M	U	S	U	U	M	U	M	U	U	U	M	M	U	U	S	U	U	U	M	S	
Chromic Acid (10%)	U	-	U	U	S	U	U	-	S	S	S	U	S	S	M	U	M	S	S	U	M	S	M	U	S	S	S	
Chromic Acid (50%)	U	-	U	U	-	U	U	-	-	-	S	U	U	S	M	U	M	S	S	U	M	S	-	U	M	-	S	
Cresol Mixture	S	S	U	-	-	-	S	-	S	U	U	U	U	U	U	-	-	U	U	-	U	S	S	S	S	U	S	
Cyclohexane	S	S	S	-	S	S	S	U	S	U	S	S	U	U	U	M	S	M	U	M	M	S	U	M	M	U	S	
Deoxycholate	S	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	S	S	S	S	
Distilled Water	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
Dextran	M	S	S	S	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	
Diethyl Ether	S	S	U	U	S	S	S	U	S	U	U	S	U	U	U	U	U	U	U	U	U	S	S	S	S	M	U	
Diethyl Ketone	S	-	U	U	-	-	M	-	S	U	-	S	-	M	U	U	U	M	M	-	U	S	-	-	S	U	U	
Diethylpyrocarbonate	S	S	U	-	S	S	S	-	S	S	U	S	U	S	U	-	-	S	S	S	M	S	S	S	S	S	S	
Dimethylsulfoxide	S	S	U	U	S	S	S	-	S	U	S	S	U	S	U	U	-	S	S	U	U	S	S	S	S	U	U	
Dioxane	M	S	U	U	S	S	M	M	S	U	U	S	U	M	U	U	-	M	M	M	U	S	S	S	S	U	U	
Ferric Chloride	U	U	S	-	-	-	M	S	-	M	-	S	-	S	-	-	-	S	S	-	-	-	M	U	S	-	S	
Acetic Acid (Glacial)	S	S	U	U	S	S	U	M	S	U	S	U	U	U	U	U	M	S	U	M	U	S	U	U	S	-	U	
Acetic Acid (5%)	S	S	M	S	S	S	M	S	S	S	S	S	M	S	S	S	S	S	S	S	M	S	S	M	S	S	M	
Acetic Acid (60%)	S	S	U	U	S	S	U	-	S	M	S	U	U	M	U	S	M	S	M	S	M	S	M	U	S	M	U	
Ethyl Acetate	M	M	U	U	S	S	M	M	S	S	U	S	U	M	U	U	-	S	S	U	U	S	M	M	S	U	U	
Ethyl Alcohol (50%)	S	S	S	S	S	S	M	S	S	S	S	S	U	S	U	S	S	S	S	S	S	S	S	M	S	M	U	
Ethyl Alcohol (95%)	S	S	S	U	S	S	M	S	S	S	S	S	U	S	U	-	S	S	S	M	S	S	S	U	S	M	U	
Ethylene Dichloride	S	-	U	U	-	-	S	M	-	U	U	S	U	U	U	U	U	U	U	-	U	S	U	-	S	-	S	
Ethylene Glycol	S	S	S	S	S	S	S	S	S	S	S	S	-	S	U	S	S	S	S	S	S	S	S	M	S	M	S	
Ethylene Oxide Vapor	S	-	U	-	-	U	-	-	S	U	-	S	-	S	M	-	-	S	S	S	U	S	U	S	S	S	U	
Ficoll-Hypaque®	M	S	S	-	S	S	S	-	S	S	S	S	-	S	S	-	S	S	S	S	S	S	M	S	S	S	S	

CHEMICAL	MATERIAL	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN®	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL®	NYLON	PET ¹ , POLYCLEAR®, CLEARCRIMP®, CCCLEARCRIMP®	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®
Hydrofluoric Acid (10%)	U	U	U	M	-	-	U	-	-	U	U	S	-	S	M	U	S	S	S	S	M	S	U	U	U	-	-	
Hydrofluoric Acid (50%)	U	U	U	U	-	-	U	-	-	U	U	U	U	S	U	U	U	S	S	M	M	S	U	U	U	-	M	
Hydrochloric Acid (conc.)	U	U	U	U	-	U	U	M	-	U	M	U	U	M	U	U	U	-	S	-	U	S	U	U	U	-	-	
Formaldehyde (40%)	M	M	M	S	S	S	S	M	S	S	S	S	M	S	S	S	U	S	S	M	S	S	S	M	S	M	U	
Glutaraldehyde	S	S	S	S	-	-	S	-	S	S	S	S	S	S	S	-	-	S	S	S	-	-	S	S	S	-	-	
Glycerol	M	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	-	S	S	S	S	S	S	S	S	S	S	
Guanidine Hydrochloride	U	U	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	U	S	S	S	
Haemo-Sol®	S	S	S	-	-	-	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	S	S	S	S	
Hexane	S	S	S	-	S	S	S	-	S	S	U	S	U	M	U	S	S	U	S	S	M	S	U	S	S	U	S	
Isobutyl Alcohol	-	-	M	U	-	-	S	S	-	U	-	S	U	S	S	M	S	S	S	-	S	S	S	-	S	-	S	
Isopropyl Alcohol	M	M	M	U	S	S	S	S	S	U	S	S	U	S	U	M	S	S	S	S	S	S	S	M	M	M	S	
Iodoacetic Acid	S	S	M	-	S	S	S	-	S	M	S	S	M	S	S	-	M	S	S	S	S	S	M	S	S	M	M	
Potassium Bromide	U	S	S	-	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	-	S	S	S	M	S	S	S	
Potassium Carbonate	M	U	S	S	S	S	S	-	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	
Potassium Chloride	U	S	S	-	S	S	S	S	S	S	S	S	S	S	S	-	S	S	S	S	S	S	S	U	S	S	S	
Potassium Hydroxide (5%)	U	U	S	S	S	S	M	-	S	S	S	S	-	S	U	S	S	S	S	S	S	S	M	U	M	S	U	
Potassium Hydroxide (conc.)	U	U	M	U	-	-	M	-	M	S	S	-	U	M	U	U	U	S	M	-	M	U	-	U	U	-	U	
Potassium Permanganate	S	S	S	-	S	S	S	-	S	S	S	U	S	S	S	M	-	S	M	S	U	S	S	M	S	U	S	
Calcium Chloride	M	U	S	S	S	S	S	S	S	S	S	S	S	S	M	S	-	S	S	S	S	S	S	M	S	S	S	
Calcium Hypochlorite	M	-	U	-	S	M	M	S	-	M	-	S	-	S	M	S	-	S	S	S	M	S	M	U	S	-	S	
Kerosene	S	S	S	-	S	S	S	U	S	M	U	S	U	M	M	S	-	M	M	M	S	S	U	S	S	U	S	
Sodium Chloride (10%)	S	-	S	S	S	S	S	-	-	-	S	S	S	S	S	-	S	S	S	S	-	S	S	M	-	S	S	
Sodium Chloride (sat'd)	U	-	S	U	S	S	S	-	-	-	-	S	S	S	S	-	S	S	-	S	-	S	S	M	-	S	S	
Carbon Tetrachloride	U	U	M	S	S	U	M	U	S	U	U	S	U	M	U	S	S	M	M	S	M	M	M	M	U	S	S	
Aqua Regia	U	-	U	U	-	-	U	-	-	-	-	-	U	U	U	U	U	U	U	-	-	-	-	-	S	-	M	
Solution 555 (20%)	S	S	S	-	-	-	S	-	S	S	S	S	S	S	S	-	-	S	S	S	-	S	S	S	S	S	S	
Magnesium Chloride	M	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	
Mercaptoacetic Acid	U	S	U	-	S	M	S	-	S	M	S	U	U	U	U	-	S	U	U	S	M	S	U	S	S	S	S	
Methyl Alcohol	S	S	S	U	S	S	M	S	S	S	S	S	U	S	U	M	S	S	S	S	S	S	S	M	S	M	U	
Methylene Chloride	U	U	U	U	M	S	S	U	S	U	U	S	U	U	U	U	U	U	M	U	U	U	S	S	M	U	U	

A Chemical Compatibility Chart

CHEMICAL	MATERIAL																											
	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN®	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL®	NYLON	PET ¹ , POLYCLEAR®, CLEARCRIMP®, CCCLEARCRIMP®	POLYALLUMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®	
Methyl Ethyl Ketone	S	S	U	U	S	S	M	S	S	U	U	S	U	S	U	U	U	S	S	U	U	S	S	S	S	U	U	
Metrimamide®	M	S	S	-	S	S	S	-	S	S	S	S	-	S	S	-	-	S	S	S	S	S	S	S	M	S	S	S
Lactic Acid (100%)	-	-	S	-	-	-	-	-	-	M	S	U	-	S	S	S	M	S	S	-	M	S	M	S	S	-	S	
Lactic Acid (20%)	-	-	S	S	-	-	-	-	-	M	S	M	-	S	S	S	S	S	S	S	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	M	S	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	U	S	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	M	S	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	M	S	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	U	M	S	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	M	S	U	S	S	S	S	U	S	S	S	S	U	S	U	M	S	M	S	

CHEMICAL	MATERIAL																										
	ALUMINUM	ANODIC COATING for ALUMINUM	BUNA N	CELLULOSE ACETATE BUTYRATE	POLYURETHANE ROTOR PAINT	COMPOSITE Carbon Fiber/Epoxy	DELRIN®	ETHYLENE PROPYLENE	GLASS	NEOPRENE	NORYL®	NYLON	PET ¹ , POLYCLEAR®, CLEARCRIMP®, CCCLEARCRIMP®	POLYALLOMER	POLYCARBONATE	POLYESTER, GLASS THERMOSET	POLYETHERIMIDE	POLYRTHYLENE	POLYPROPYLENE	POLYSULFONE	POLYVINYL CHLORIDE	RULON A®, TEFLON®	SILICONE RUBBER	STAINLESS STEEL	TITANIUM	TYGON®	VITON®
Pyridine (50%)	U	S	U	U	S	U	U	-	U	S	S	U	U	M	U	U	-	U	S	M	U	S	S	U	U	U	U
Rubidium Bromide	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Rubidium Chloride	M	S	S	-	S	S	S	-	S	S	S	S	S	S	S	-	-	S	S	S	S	S	S	M	S	S	S
Sucrose	M	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Sucrose, Alkaline	M	S	S	-	S	S	S	-	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	M	S	S	S
Sulfosalicylic Acid	U	U	S	S	S	S	S	-	S	S	S	U	S	S	S	-	S	S	S	-	S	S	S	U	S	S	S
Nitric Acid (10%)	U	S	U	S	S	U	U	-	S	U	S	U	-	S	S	S	S	S	S	S	S	S	M	S	S	S	S
Nitric Acid (50%)	U	S	U	M	S	U	U	-	S	U	S	U	U	M	M	U	M	M	M	S	S	S	U	S	S	M	S
Nitric Acid (95%)	U	-	U	U	-	U	U	-	-	U	U	U	U	M	U	U	U	U	M	U	U	S	U	S	S	-	S
Hydrochloric Acid (10%)	U	U	M	S	S	S	U	-	S	S	S	U	U	S	U	S	S	S	S	S	S	S	S	U	M	S	S
Hydrochloric Acid (50%)	U	U	U	U	S	U	U	-	S	M	S	U	U	M	U	U	S	S	S	S	M	S	M	U	U	M	M
Sulfuric Acid (10%)	M	U	U	S	S	U	U	-	S	S	M	U	S	S	S	S	S	S	S	S	S	S	U	U	U	S	S
Sulfuric Acid (50%)	M	U	U	U	S	U	U	-	S	S	M	U	U	S	U	U	M	S	S	S	S	S	U	U	U	M	S
Sulfuric Acid (conc.)	M	U	U	U	-	U	U	M	-	-	M	U	U	S	U	U	U	M	S	U	M	S	U	U	U	-	S
Stearic Acid	S	-	S	-	-	-	S	M	S	S	S	S	-	S	S	S	S	S	S	S	S	S	M	M	S	S	S
Tetrahydrofuran	S	S	U	U	S	U	U	M	S	U	U	S	U	U	U	-	M	U	U	U	U	S	U	S	S	U	U
Toluene	S	S	U	U	S	S	M	U	S	U	U	S	U	U	U	S	U	M	U	U	U	S	U	S	U	U	M
Trichloroacetic Acid	U	U	U	-	S	S	U	M	S	U	S	U	U	S	M	-	M	S	S	U	U	S	U	U	U	M	U
Trichloroethane	S	-	U	-	-	-	M	U	-	U	-	S	U	U	U	U	U	U	U	U	U	S	U	-	S	-	S
Trichloroethylene	-	-	U	U	-	-	-	U	-	U	-	S	U	U	U	U	U	U	U	U	U	S	U	-	U	-	S
Trisodium Phosphate	-	-	-	S	-	-	M	-	-	-	-	-	-	S	-	-	S	S	S	-	-	S	-	-	S	-	S
Tris Buffer (neutral pH)	U	S	S	S	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Triton X-100®	S	S	S	-	S	S	S	-	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Urea	S	-	U	S	S	S	S	-	-	-	-	S	S	S	M	S	S	S	S	-	S	S	S	M	S	-	S
Hydrogen Peroxide (10%)	U	U	M	S	S	U	U	-	S	S	S	U	S	S	S	M	U	S	S	S	S	S	S	M	S	U	S
Hydrogen Peroxide (3%)	S	M	S	S	S	-	S	-	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S
Xylene	S	S	U	S	S	S	M	U	S	U	U	U	U	U	U	M	U	M	U	U	U	S	U	M	S	U	S
Zinc Chloride	U	U	S	S	S	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

A Chemical Compatibility Chart

¹Polyethyleneterephthalate

Key

- S Satisfactory
- M 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 U = Unsatisfactory, not recommended.
- Performance unknown; suggest testing, using sample to avoid loss of valuable material.

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

Warranty

Thermo Fisher Scientific makes no warranty of any kind, expressed or implied, except as stated in this warranty policy.

The Thermo Scientific RC 12BP+™ Centrifuge is warranted (subject to the conditions specified below and in the warranty clause of the Thermo Fisher Scientific terms and conditions of sale in effect at the time of sale) to be free from defects in material and workmanship for a period of one (1) year from the date of delivery. Thermo Fisher Scientific will repair or replace and return free of charge any part which is returned to its factory within said period, transportation prepaid by user, and which is found upon inspection to have been defective in materials or workmanship. This warranty does not include normal wear from use, it does not apply to any instrument or part which has been altered by anyone other than an employee of Thermo Fisher Scientific, nor to any instrument which has been damaged through accident, negligence, failure to follow operating instructions, the use of electric currents or circuits other than those specified on the plate affixed to the instrument, misuse or abuse.

Thermo Fisher Scientific reserves the right to change, alter, modify or improve any of its instruments without any obligation whatever to make corresponding changes to any instrument previously sold or shipped.

The foregoing obligations are in lieu of all other obligations and liabilities including negligence and all warranties, of merchantability or otherwise, expressed or implied in fact or by law, and state our entire and exclusive liability and buyer's exclusive remedy for any claim or damages in connection with the sale or furnishing of goods or parts, their design, suitability for use, installation or operation. Thermo Fisher Scientific will in no event be liable for any special or consequential damages whatsoever, and our liability under no circumstances will exceed the contract price for the goods for which liability is claimed.

Terms may vary by country. Please contact your local sales office for further information.

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