

Espresso
User's Manual



Analyze • Detect • Measure • Control™

Espresso User's Manual



Espresso

Carefully read this manual before operating your instrument.

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The validity of the guarantee is subject to the observation of the instructions and precautions described in this document.

Packing List

11210799 Centrifuge Espresso 100V 50/60 Hz

Item number		Quantity	Check
	Centrifuge Espresso - 100V 50/60 Hz	1	<input type="checkbox"/>
11210802	Rotor 12x1,5/2,2 mL	1	<input type="checkbox"/>
11210803	Rotor lid	1	<input type="checkbox"/>
85440340	Rotor unit	1	<input type="checkbox"/>
89003150	User manual	1	<input type="checkbox"/>
11202744	Mains cable (120V)	1	<input type="checkbox"/>
-	Lid opening tool	1	<input type="checkbox"/>

11210800 Centrifuge Espresso 120V 60 Hz

Item number		Quantity	Check
	Centrifuge Espresso - 120V 60 Hz	1	<input type="checkbox"/>
11210802	Rotor 12x1,5/2,2 mL	1	<input type="checkbox"/>
11210803	Rotor lid	1	<input type="checkbox"/>
85440340	Rotor unit	1	<input type="checkbox"/>
89003150	User manual	1	<input type="checkbox"/>
11202744	Mains cable (120V)	1	<input type="checkbox"/>
-	Lid opening tool	1	<input type="checkbox"/>

11210801 Centrifuge Espresso 230V 50/60 Hz

Item number		Quantity	Check
	Centrifuge Espresso - 230V 50/60 Hz	1	<input type="checkbox"/>
11210802	Rotor 12x1,5/2,2 mL	1	<input type="checkbox"/>
11210803	Rotor lid	1	<input type="checkbox"/>
85440340	Rotor unit	1	<input type="checkbox"/>
89003150	User manual	1	<input type="checkbox"/>
11202744	Mains cable (230V)	1	<input type="checkbox"/>
-	Lid opening tool	1	<input type="checkbox"/>

For missing parts call your nearest Thermo representative

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Great Britain



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Guarantee Terms

Thermo guarantees that this unit is free from defects in materials and workmanship when it leaves the factory, and will replace or repair the unit if it proves defective in normal use or during service for a period of ONE YEAR from the delivery.

This guarantee is invalid if the unit is incorrectly used, poorly serviced or neglected, mis-used or accidentally damaged.

There is no explicit guarantee other than as stated above.

For further information, assistance or service

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Chapter 1 Use and Function

User Manual

The user manual is part of the centrifuge, and contains important information for your safety and for the best use of the equipment.

Always keep the manual close to the appliance and in a safe place, so that it is always available. Thermo strongly recommends that all users read this manual carefully.

Warning Symbols

The following symbols are provided to help the operator take advantage of the protection afforded by the equipment and to warn of potential danger.



The following symbols are provided for the operator to know how to take advantage of the protection afforded by the equipment and to avoid dangers.



On the main switch, allows centrifuge to operate if pressed. ▲



Only authorized personnel may handle the parts marked with this symbol and only after switching off the mains supply. Working with high voltages could cause severe injuries. ▲



In the following manual, this symbol means that you will find important information for safety. If these announcements are not observed the user risks damaging the appliance and/or harming an operator. ▲



In the following manual, this symbol means that you will find important information concerning biological risk: if these announcements are not observed the user and bystanders risk exposure to biohazards. ▲

Description

The Thermo Espresso centrifuge is designed for laboratory use. Through the application of Relative Centrifugal Force (RCF), it allows the separation of substances made of different density elements. A control system permits the user, through an extremely intuitive control panel, to set and control the speed, g-force and run time, as well as to receive different messages and warnings. The Thermo Espresso rotors are compatible with microtubes with capacity from 0.2 mL to 2 mL. The Thermo Espresso is a ventilated

Refrigeration and Heating Systems

unit. A permanent air circulation reduces the heat level in the bowl. However the temperature in the bowl can exceed 10 °C above the ambient temperature after hours of continuous operation.

Drive System

A brushless motor drives the rotating equipment. During the run, the rotor is contained in an armor plated centrifugation chamber. The brushless motor requires **no maintenance**. A control system ensures the correct drive speed, which is continuously monitored.

Safety Interlock System

The Thermo Espresso centrifuge is equipped with a motorized interlock system that assures two basic safety features:

- The run **cannot be started** if the lid is not correctly closed.
- The centrifuge lid **cannot be opened** if the rotor is running.

During the run, the lid remains latched until the rotor stops spinning. As soon as the run end and the rotor is fully stopped, the lid latch is automatically disengaged and the lid may be easily opened.

If a power failure occurs, access to the samples in the centrifuge is possible via a manual lid opening procedure (see appropriate paragraph). For this operation a special tool (supplied with the centrifuge) is required.



Bypass the interlock system only under emergency conditions as the rotor could still be rotating. ▲

Relative Centrifugal Force

Relative Centrifugal Force (RCF), at the circumference of the rotor is directly proportional to the speed (rpm) and radius of the rotor. Therefore, a greater rpm and/or a larger radius produces a greater RCF and improved faster separation of substances.

The centrifuge control system carries out and displays the results of all calculations related to speed and RCF.

Configuration formule

Legend

R = radius (in millimetres)

N = speed (in r.p.m.) ÷ 1000

RCF = gravitational acceleration 'g'

M+ = add to memory

MR = memory recall

Note To calculate actual results, press the keys on a pocket calculator in the order shown. ▲

Primary calculations	Key sequence (not valid for CASIO, HP)
RCF (x g) = $1.118 R N^2$	$N \times = \times 1.118 \times R =$
Speed (r.p.m.) = $946 \sqrt{\frac{RCF}{R}}$	$RCF \div R = \sqrt{\times 946} =$
Radius (mm) = $\frac{RCF}{1.118 N^2}$	$N \times = \times 1.118 = M+ RCF \div MR =$

Transformations	Key sequence
To determine actual 'g' achieved at a different speed:	
$RCF2 = RCF1 \left(\frac{N2}{N1}\right)^2$	$N2 \div N1 = \times = \times RCF1 =$
To determine actual speed required to achieve a different 'g' at the same radius:	
$N2 = N1 \sqrt{\frac{RCF2}{RCF1}}$	$RCF2 \div RCF1 = \sqrt{\times N1} =$
To determine actual speed required to achieve the same 'g' at a different radius:	
$N2 = N1 \sqrt{\frac{R1}{R2}}$	$R1 \div R2 = \sqrt{\times N1} =$

Chapter 2 Specifications

Dimensions and Weight

Centrifuge		
Height	15 cm	5.90 in
Width	25 cm	9.84 in
Depth	20 cm	7.87 in
Net Weight	4.2 Kg	9.26 lbs.

Package		
Height	20 cm	7.87 in
Width	28 cm	11,02 in
Depth	28 cm	11,02 in
Net Weight	5.5 Kg	12.13 lbs.

Configuration Specifications

Espresso	
Max. speed:	14600 rpm
Max. RCF at tip:	14500 x g
Max. Capacity:	12 x 2 mL
Max. allowable density:	1200 Kg/ m ³
Max. allowable weight:	28.8 g (0.048 kg including tubes)
Work temperature:	T _{amb} + ΔT
Max ΔT:	12 °C
Max. noise:	56 dBA
Microprocessor controlled	
Speed set:	5000 to 14600 rpm, step 100 rpm
Speed display accuracy:	100 rpm
RCF set:	1700 to 14500 xg, step 100 x g
RCF display accuracy:	100 xg
Timer set:	15 seconds to 99 min + "Hold" (continuous mode)
Timer set step:	
	15 seconds (up to 1 minute)
	1 minute (between 1 and 99 minutes)
Timer step (both count-up and count-down mode)	
	1 minute between 99 minutes and 1 minute.
	1 second between 1 minute and 0.

Electrical Specifications

Espresso	
Nominal operating voltage:	230V ± 10% 50/60 Hz
	120V ± 10% 60 Hz
	100V ± 10% 50/60 Hz
Max peak current (during acceleration):	1,5 Arms (at 230V)
	2,5 Arms (at 120V)
	2,9 Arms (at 100V)
Max power (steady state):	60 W
Heat output (steady state):	208 Btu/h

Chapter 3 Installation

Environmental Conditions

General conditions accepted for centrifuge transport and storage are:

- Ambient temperature -20°C to +50°C.
- Relative humidity up to 90%.

General conditions accepted for operating the centrifuge safely are:

- Indoor use.
- Temperature: 5 °C to 40 °C.
- Maximum relative humidity of 85%.
- Maximum altitude: 2000 m
- Installation category: II
- Pollution degree: 2

Unpacking

All lifting and transporting must be carried out by using proper handling equipment and by people having undergone the necessary training. **Thermo strongly recommends that all operators comply with the local laws and regulations on safety and health in the workplace.**

- Unpack the centrifuge, carefully removing any possible accessory you might find in the package
- Check the contents of packaging using the packing list provided above.
- Keep the packaging until the centrifuge has been tested.

The machine must be installed in a dust and corrosion free room. Place the centrifuge on a bench top, which must be rigid, horizontal and sufficiently strong to support the centrifuge weight and any possible small vibrations.



Leave a 30 cm / 11.81 in space free on each side of and behind the machine for safety reasons and for correct ventilation. ▲

Mains Supply

Check mains and frequency: they must correspond to the values shown on the instrument identification label.

Cat number	Content	Voltage	Frequency	Type
11210799	Espresso – 100V	100V ± 10%	50/60 Hz	1 phase + ground
11210800	Espresso – 120V	120V ± 10%	60 Hz	1 phase + ground
11210801	Espresso – 230V	230V ± 10%	50/60 Hz	1 phase + ground



For your safety, check that mains wires are effectively grounded. Thermo declines all responsibility for any damages due to non-grounding of the machine.

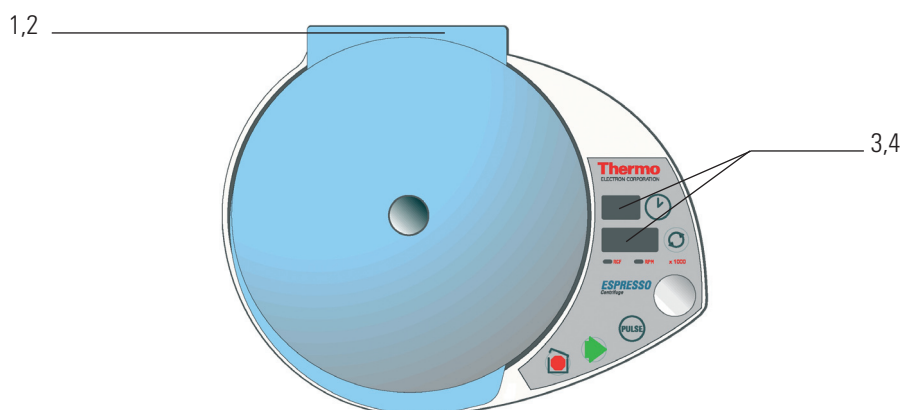
In order to fully disconnect the equipment from the power supply, it is mandatory to physically disconnect the mains cable. The switch cuts the product functionality only. ▲

Remember that in order to respect the electrical safety standards related to protection against indirect contact, the supply of power to the instrument must be via a power socket fitted with a protection device ensuring automatic cut-off in the case of an insulation fault. A supply fitted with a circuit breaker of the correct rating complies with this requirement.

Lid Opening and Rotor Checking

- Connect the mains lead to the back of the unit and to a power socket
- Switch the centrifuge by pressing “I” on the main switch located on the back side of the unit.
- The software version will appear during the initial self test
- A led test will be performed

Press the LID OPEN key, and lift the centrifuge lid. The Thermo Espresso is delivered with the rotor inside.

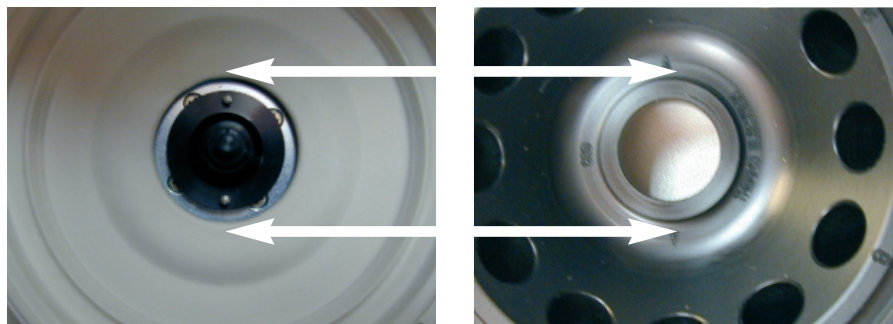


To remove the rotor

- Remove the lid
- Unscrew the rotor locking nut from the engine shaft **counter-clockwise** (no tool is required!)
- Remove the rotor from the shaft

To install the rotor

- Check that the motor shaft and rotor are clean
- Put the rotor on the motor shaft ensuring the correct **alignment** between the shaft pins (a) and the rotor arrows (b)
- Secure the rotor on the shaft by turning the nut **clockwise**
- Verify that the rotor cannot be removed by trying to pull it (gently) off the shaft.



Manual Lid Unlocking Procedure

In the event of mains non-availability or power failure, opening of the lid is prevented by the lid locking safety device. It is recommended to wait for the mains to be switched back on so that this safety device enables the lid to be unlocked.



Rotating parts are a risk as they could come in contact with the user or be ejected. There is particularly high risk of injury if:

- The user attempts to manually stop the rotor
- Any object falls inside the centrifugation chamber while the rotor is running. ▲

Manual lid unlocking may be necessary under a very limited number of conditions, such as the urgent recovery of critical samples that could be damaged if left in the centrifuge rotor.

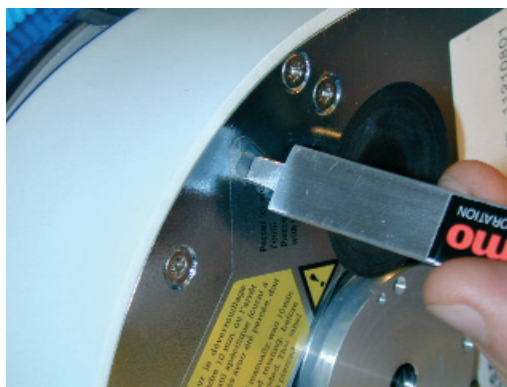
In this case the lid can be opened by using the special tool supplied with the centrifuge.



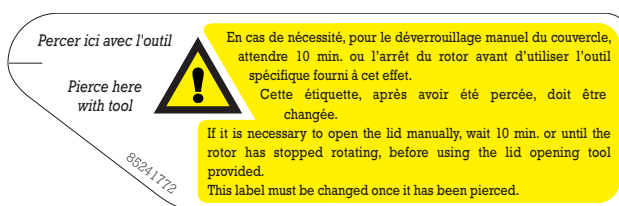
Always set the mains switch to the “O” position before performing this manual procedure, even in the case of a mains power outage. ▲

Should the emergency occur due to electricity failure during centrifugation, wait at least 10 minutes for the rotating equipment to stop spinning. In spite of the absence of noise, the rotor may still be rotating when you begin to open the lid manually.

- Insert the unlocking tool (or a flat screwdriver) horizontally into the hole on the right hand side of the instrument by piercing the protection sticker
- By using the tools, turn the gear inward until the lid latch is disengaged.
- Upon opening, lift the lid by hand and observe the rotor (be careful with this operation): if it is still rotating, close the lid and wait.



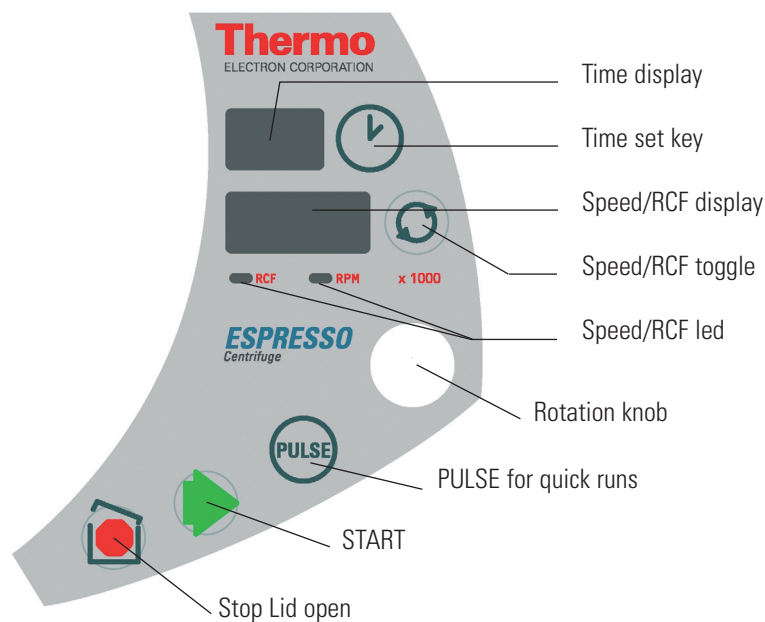
The protection sticker must be replaced after it has been pierced (item 85241801)



Chapter 4 Instructions for Use

Controls and Indicators

All the controls are located on the front panel (except for the mains switch which is at the back of the centrifuge). The Thermo Espresso front panel is an intuitive interface: no previous operational knowledge is necessary; every parameter can be set by rotating the knob continuously, from the minimum to the maximum and viceversa. All parameters can be accessed and changed both during operation and while the machine rest.



Key Indicator	Function
	Starts the centrifugation run. The run will start only if the lid is properly locked.
	Stops the centrifugation run. When the rotor is at full rest, the lid will open automatically. This key can also be used to open the lid once it has been closed, but the run is not started.
	Pulse key for very short runs. The motor accelerates to the set speed while the key is pressed and brakes when the key is released.
	Pressing this key allows time set using the knob. Digital display of run time: <ul style="list-style-type: none"> • Counts-up in PULSE and Hd (continuous) mode • Counts-down in time-set mode
	Pressing this key allows toggle between speed (RPM) and RCF (xg) and set of the corresponding parameter, using the knob. This function is available either during set or during the run.
	Digital Display of Speed = 5000 to 14600 rpm. Digital Display of RCF = 1800 to 14500 x g. A LED is illuminated to indicate the selected unit (rpm or RCF).

How to Prepare to the First Run

Before installation, the rotor should be thoroughly inspected for evidence of damage and for cleanliness.

Chemical and stress corrosion of plastic parts will eventually lead to disruption of the rotor with potential severe damage to the centrifuge. Particles stuck inside the pockets can cause breakage of tubes and lead to major imbalance and / or loss of sample and contamination.

The central hole of the rotor and the 2 drive spindles should also be clean and undamaged. These parts should be wiped clean on regular basis

The centrifuge also should be observed: screw, lid hooks, latch and evidence of corrosion.



In case of problems contact your Thermo Service representative, because any deviation from the above mentioned advice may have serious consequences for the safety of the appliance and of the operators. ▲



Normal use of the centrifuge could require the manipulation of biohazards. The users and service personnel must have specific training for each substance they use, according to the “Laboratory Biosafety Manual” from the World Health Organization. ▲

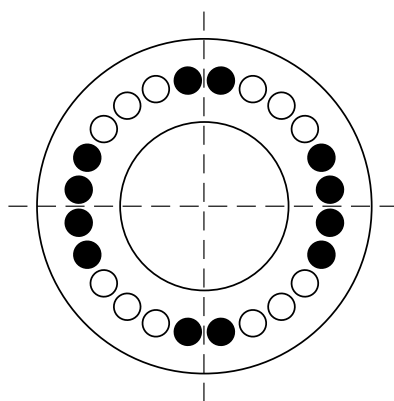
Sample Loading

The contents of each rotor pocket including sample, tube, cap and adapter (where used) must be of the same weight as the one diametrically opposite.

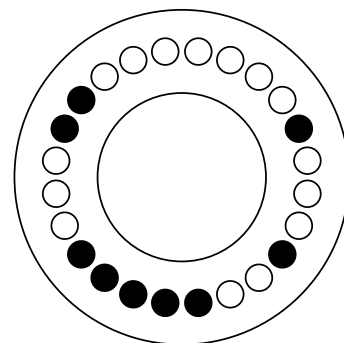


Imbalance of the rotor may cause **major damage to the rotor and centrifuge**. Do not attempt to introduce liquids into rotor pockets or into tubes already in the pockets. ▲

Distribute the load correctly. Loads should be inserted two by two, of equal weight, at 180 degrees from the rotation axis and at equal distance (radius) from the center of rotation (see picture)



Correct



! Incorrect

If less than the maximum complement of samples is loaded, the tubes must be placed in opposite pockets.
An odd number of tubes requires an additional blank, water-filled tube of identical total weight to balance.
Significant vibrations can damage the accessories, the unit and the samples. Most vibration is caused by incorrect loading of the tubes

Operating the Unit

After having placed, locked and loaded the rotor, lower the centrifuge lid.

A motorized lid latch will secure the lid as soon as the start or pulse key are pressed.

If one or more parameters need to be changed:

- Select the time by pressing the TIME key and rotating the knob to the desired value.
- Select the speed / RCF by pressing the speed / RCF key and rotate the knob to the desired value. Toggle between speed (RPM) and RCF (xg) by pressing the speed/RCF key.

If the set parameters currently displayed are those desired, the instrument is ready to run.



The presence of the operator is necessary

- **from the start until centrifuge reaches set speed.**
- **at the end of the centrifugation run. ▲**

Press **START** or **PULSE** key.

The **START** key runs the program, while - for very short runs - continuously pressing on the **PULSE** key permits the rotor to accelerate to the maximum speed.

If the lid is not closed properly, the display will indicate “Lid”. As soon as the lid is properly closed, the run parameters will be redisplayed and the run can be started.

During a run, the **RPM** display shows the actual speed, while the time display will show:

- **remaining** run time “*count-down*” if the **START** key was pressed
- **elapsed** run time in minutes “*count-up*” if the **PULSE** key was pressed or **Hd** selected.

To change set values during a run:

- press the TIME or speed / RCF key

- turn the knob to the desired value

The display shows the set value for 2 seconds; during this time, it is possible to change set value.

End of the run

Deceleration will take place when the run time is completely elapsed, or the PULSE key is released, or the STOP key is pressed.

At the end of the run the user is alerted to the fact that samples remain in the centrifuge.

For this reason, **the lid will open automatically** at the end of the run.

Note The centrifuge stop may also occur automatically for:

- load imbalance
- sudden power failure
- error or components breakdown ▲

See the “messages” section for details.

Chapter 5 Messages

Information Messages

Information messages are an integral part of the routine operations: they are friendly and the meanings are easy to understand.

LED message	Signification	Action
SF	Software release	Wait few seconds
X.X	The centrifuge is powered on, and the initial self test is being performed.	
00	You can open the centrifuge lid	Press on LID OPEN key
00.0		

Error Messages

Error messages relate to **improper operating procedures**.

LED message	Signification	Action
Lid	Lid is open when trying to start	Close lid before pressing the START or PULSE key. If the message persists, call Thermo Service
Er LJA	The lid opening system has been activated but the lid could not open	Check that the lid is free to open. Try again by pressing the LID OPEN key
Usr	You entered the diagnostic mode	Do not press any key Switch the centrifuge off and restart

Alarm Messages



Alarm messages relate to dangerous operations or fault conditions ▲

LED message	Signification	Action
No display	No main power connection Power failure	Plug in the main power cable Check the main power fuses: if they are burned out, call Thermo Service for a diagnosis of any possible fault before replacing the fuses
Lid	The lid is closed but the message persists	Call Thermo Service
Er Lid	Lid open during running (possible latch fault)	Call Thermo Service
Er OSP	Over speed	Call Thermo Service
Er NoS	Speed sensor failure Motor failure Drive failure	Call Thermo Service
Er HAL	Speed sensor failure	Call Thermo Service
Er Shr	Internal component damage	Call Thermo Service
Er Spd	Internal component damage	Call Thermo Service
Er PFA	Power failure during the run	The rotor stops inertially Press STOP and restart

Chapter 6 Hazards, Precautions and Limitations of Use

IEC 1010-2-020

This centrifuge conforms to the IEC 1010-2-020 international standard, which specifies particular safety requirements for laboratory centrifuges.

According to the standard warnings, the operator must respect the following precautions :

- Mark a boundary area of 30 cm around the centrifuge.
- No person or hazardous material can stay within this boundary longer than necessary for operational reasons, while the centrifuge is operating.
- An emergency switch for disconnection of the mains, in case of malfunction, has to be available and familiar to all the persons operating the centrifuge. This switch has to be remote from the laboratory centrifuge, preferably outside the room in which the centrifuge is located, or adjacent to the exit from that room.

Cautions



- Moving or shifting the machine during centrifugation is dangerous.
- Using the centrifuge with rotating equipment showing signs of corrosion and wear, and manipulating and/or tampering with the electronic and mechanical parts constitute dangerous operations. ▲
- Never try to bypass the lid safety interlock while the rotor is spinning.
- Do not try to open the lid until the display returns to the stand-by mode.
- Only use a correctly grounded mains source.
- Use only rotors and accessories designed for use in the Thermo Espresso centrifuge.

Pay special attention to the following:

- Installation of the unit: proper ventilation, leveling of the centrifuge, rigidity and stability of the support.

- Rotor installation: verify that the rotor is locked in position before use.
- Cleaning of the accessories and of the rotor chamber is particularly necessary when corrosive products are present in the samples (saline, acids, bases).
- Load balancing.

IF ANY DANGEROUS EVENT OCCURS, KEEP YOURSELF FAR AWAY FROM THE INSTRUMENT AND SWITCH OFF THE MAIN POWER SOURCE

Rotor Maintenance

Cleaning

Ideally, rotors should be washed after every use and at least weekly in warm water containing a few drops of mild non alkaline detergent (domestic liquid soap is ideal) and **every time a spill has occurred**. Do not forget to wash the core of the rotor that comes into contact with the drive spindle.

Each pocket of the rotor must be washed thoroughly using a small nylon brush.

Do not use metal wire brushes.

Once the rotor is clean, rinse it in running water, preferably distilled water.

Dry the rotor with a soft absorbent non-woven cloth or tissue. Drying may be finished off with a warm air jet (e.g. a hair dryer).

Make sure that the pockets are well dried.

Contamination Hazards

The Thermo Espresso is likely to be used in medical research where hazardous substances, including radioactive chemicals, are frequently found.



ALWAYS USE THE APPROPRIATE DECONTAMINATION PROCEDURES WHERE THE ROTOR IS EXPOSED TO THESE CHEMICALS. ▲

Examples of commonly used techniques are outlined below. The information is given as a guideline only. It is the responsibility of the owner to use the most suitable procedure.

If decontamination procedures require the use of warming (i.e. autoclave) the rotating equipment should always be completely disassembled before being subjected to heat and after external chemical cleaning. Seals should be decontaminated with the method most suitable for them, which might not be the same as for the body of the rotating equipment.

Disinfection

Alcohol (70% ethanol or isopropanol) applied for 10 minutes is ideal for bacteria and viruses.

Autoclave for 20 minutes at 120°C to destroy micro-organisms.

The polypropylene rotors are autoclavable.

Rotor lids must be disassembled from rotor bodies. ‘O’ rings, autoclaved separately, should be replaced when deformed.

Any part which has been subjected to temperatures above 130 C° must be discarded

Hypochlorite “bleach” used at 0.1% concentration with 10 minutes immersion is effective against bacteria, spores and viruses but, as an oxidizing agent, is corrosive to metal alloys and must be thoroughly rinsed off of metal parts and the parts dried. It should never be used if there is surface damage to the rotor.

Formalin (37% formaldehyde in water) in contact for 10 minutes has a similar effect to chlorine bleaches.

Rotors should be thoroughly rinsed under running water for 5 minutes to remove all traces of formalin then dried completely.



Formaldehyde is toxic ▲

Gluteraldehyde 2%, sold under many brand names such as Cidex and Glutarex, requires total immersion for 10 minutes to ensure sterility. Thorough rinsing and drying is essential to protect users.



Gluteraldehyde builds up to a toxic level in the fatty tissues of the body. Phenols are very corrosive and should never be used. ▲

Radioactive Decontamination

We recommend that all radioactive contamination be referred to your Radioactivity Safety Officer.

Rotors may be decontaminated by a mixture of equal volumes of :

- Distilled water,
- SDS diluted to 10%,
- Ethanol diluted to 70%.

The rotor should then be rinsed with ethanol followed by distilled water and then dried completely.

Thermo makes no claims as to the effectiveness of proprietary brands of decontaminating solutions.

Chemical Compatibility Table for Rotors, Tubes and Accessories

S = Satisfactory
 D = Discoloration but OK
 P = Pure chemical OK
 M = Moderate resistance
 U = Unsatisfactory
 X = Explosion risk !!!
 O = No information
 d = Less resistance if T > 50°C
 t = Unsatisfactory if T > 50°C

AL = Aluminum
 CAB = Cellulose acetate butyrate
 DL = Delrin
 NO = Noryl
 PA = Polyallomer (= PPCO)
 PE = Polyethylene
 PPCO = Polypropylene Copolymer
 SS = Stainless steel
 TZ = Tefzel
 VA = Viton A

BN = Buna N
 CN = Cellulose Nitrate
 KY = Kynar
 NY = Nylon
 PC = Polycarbonate
 PP = Polypropylene
 PS = Polysulfone
 TF = Teflon
 TI = Titanium

Chemical	Material	AL	BN	CAB	CN	DL	KY	NO	NY	PA	PC	PE	PP	PS	SS	TF	TZ	TI	VA
		PPCO																	
Acetaldehyde		S	U	U	U	O	O	O	O	M	U	M	M	O	S	S	M	S	U
Acetamide		O	O	O	O	O	O	O	O	S	U	S	S	S	O	O	O	O	O
Acetic Acid (5%)		S	M	S	S	M	S	S	S	S	S	S	D	S	S	S	S	S	M
Acetic Acid (20 %)		S	O	O	O	O	O	O	O	S	M	S	S	S	O	O	O	O	O
Acetic Acid (60%)		S	U	U	U	U	S	S	M	S	U	M	D	S	S	S	S	S	U
Acetic Acid (80 %)		S	O	O	O	O	O	O	O	S	U	St	S	M	O	O	O	O	O
Acetic Acid (Glacial)		S	U	U	U	U	S	O	O	S	U	M	D	M	S	S	S	S	U
Acetic Anhydride		S	O	O	O	O	O	O	O	Sd	U	U	Sd	U	O	O	O	O	O
Acetone		S	U	U	U	M	M	O	U	S	U	S	M	U	S	S	M	S	U
Acetonitrile		O	O	O	O	O	O	O	O	Mt	U	S	Mt	U	O	O	O	O	O
Acetylene		S	O	O	O	O	O	O	O	S	O	S	S	U	O	O	O	O	O
Adipic Acid		O	O	O	O	O	O	O	O	S	S	St	S	S	O	O	O	O	O
Alanine		S	O	O	O	O	O	O	O	S	S	U	S	U	O	O	O	O	O
Allyl Alcohol		O	O	U	O	S	O	O	U	O	S	S	S	O	O	S	S	S	O
Aluminum Chloride		O	O	S	S	O	S	O	S	S	S	S	S	O	U	S	S	S	O
Aluminum Fluoride		O	O	O	O	O	S	O	S	S	U	S	S	O	O	S	O	S	O
Aluminum Hydroxide		S	O	O	O	O	O	O	O	S	Mt	Sd	S	S	O	O	O	O	O
Aluminum Nitrate		M	O	O	O	O	O	O	O	S	O	O	S	O	O	O	O	O	O
Aluminum Sulphate		S	O	O	O	O	O	O	O	Sd	O	S	Sd	O	O	O	O	O	O
Amino Acids		S	O	O	O	O	O	O	O	S	S	S	S	S	O	O	O	O	O
Ammonia		S	O	O	O	O	O	O	O	S	U	S	S	Sd	O	O	O	O	O
Ammonium Acetate		O	O	O	O	O	O	O	O	S	S	S	S	O	O	S	S	S	O
Ammonium Carbonate		S	U	S	S	O	S	O	S	S	U	S	S	S	S	S	S	S	O
Ammonium Chloride		M	O	O	O	O	O	O	O	St	O	St	St	O	O	O	O	O	O
Ammonium Hydroxide (10%)		O	S	U	O	O	O	O	S	D	U	S	D	S	S	S	S	S	S
Ammonium Hydroxide (conc)		O	U	U	O	O	O	O	S	D	U	S	D	O	S	S	S	S	U
Ammonium Oxalate		O	O	O	O	O	O	O	O	Sd	S	S	Sd	S	O	O	O	O	O
Ammonium Phosphate		U	O	O	O	O	O	O	O	S	M	S	S	O	O	O	O	O	O
Ammonium Sulphate		S	S	O	O	U	O	O	S	S	S	S	S	O	S	S	S	S	O
Ammonium Sulphide		O	O	O	O	O	S	O	O	S	U	O	S	O	O	S	O	O	O
n-Amyl Acetate		S	O	O	O	O	O	O	O	Sd	U	Sd	Sd	U	O	O	O	O	O
Amyl Alcohol		S	M	U	O	S	O	O	S	S	S	S	S	O	O	S	S	S	M
Amyl Chloride		S	O	O	O	O	O	O	O	U	U	U	U	U	O	O	O	O	O
Aniline		S	O	O	O	O	S	O	O	U	O	S	M	O	O	S	S	S	O

Chapter 6

Hazards, Precautions and Limitations of Use

Chemical	Material	AL	BN	CAB	CN	DL	KY	NO	NY	PA	PC	PE	PP	PS	SS	TF	TZ	TI	VA
		PPCO																	
Aqua Regia		U	U	U	0	U	0	0	0	U	U	U	U	0	0	S	S	S	M
Barium Chloride		U	0	0	0	0	0	0	0	S	0	S	S	0	0	0	0	0	0
Barium Hydroxide		U	0	0	0	0	0	0	0	S	0	S	S	0	0	0	0	0	0
Barium Sulphate		S	0	0	0	0	0	0	0	S	0	St	S	0	0	0	0	0	0
Benzaldehyde		S	0	0	0	0	0	0	0	Sd	Mt	S	Sd	M	0	0	0	0	0
Benzene		S	U	P	0	M	0	0	S	U	U	U	U	U	S	S	S	S	S
Benzoic Acid, Sat		St	0	0	0	0	0	0	0	Sd	Sd	S	Sd	M	0	0	0	0	0
Benzyl Acetate		0	0	0	0	0	0	0	0	Sd	Mt	S	Sd	U	0	0	0	0	0
Benzyl Alcohol		S	U	U	0	M	0	0	U	U	U	U	U	0	0	S	S	S	S
Boric Acid		U	0	0	0	0	0	0	0	S	U	Sd	S	U	0	0	0	0	0
Bromine		U	0	0	0	0	0	0	0	U	Mt	U	U	U	0	0	0	0	0
Bromobenzene		U	0	0	0	0	0	0	0	U	U	U	U	U	0	0	0	0	0
Bromoform		U	0	0	0	0	0	0	0	U	U	U	U	U	0	0	0	0	0
Butadiene		S	0	0	0	0	0	0	0	U	U	U	U	U	0	0	0	0	0
Butane		S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
n-Butanol		S	S	U	0	S	0	0	U	0	M	S	S	M	0	S	S	S	S
n-Butyl Acetate		S	0	0	0	0	0	0	0	S	U	S	S	U	0	0	0	0	0
Butylene		S	0	0	0	0	0	0	0	0	0	S	0	0	0	0	0	0	0
Butyl Chloride		0	0	0	0	0	0	0	0	U	U	U	U	U	0	0	0	0	0
Butyric Acid		S	0	0	0	0	0	0	0	U	Mt	U	U	S	0	0	0	0	0
Caesium Acetate		M	0	0	0	0	0	0	0	S	S	S	S	S	0	S	S	0	0
Caesium Bromide		M	0	0	0	0	0	0	0	S	S	S	S	S	0	S	S	0	0
Caesium Chloride		M	0	S	S	0	0	0	0	S	S	S	S	S	S	S	S	S	0
Caesium Formiate		M	0	0	0	0	0	0	0	S	S	S	S	S	0	S	S	0	0
Caesium Iodide		M	0	0	0	0	0	0	0	S	S	S	S	S	0	S	S	0	0
Caesium Sulphate		M	0	0	0	0	0	0	0	S	S	S	S	S	0	S	S	0	0
Caesium Trifluoroacetate		M	0	M	U	0	0	0	0	S	S	S	S	S	M	S	0	0	0
Calcium Carbonate		U	0	0	0	0	0	0	0	S	0	St	S	0	0	0	0	0	0
Calcium Chloride		M	S	S	0	S	0	0	S	S	M	0	D	S	S	S	0	S	S
Calcium Hypochlorite		M	U	0	0	M	S	0	S	S	M	S	S	S	U	S	0	S	S
Calcium Sulphate		M	0	0	0	0	0	0	0	S	0	St	S	0	0	0	0	0	0
Carbazole		0	0	0	0	0	0	0	0	S	U	S	S	U	0	0	0	0	0
Carbon Sulphide		S	0	0	0	0	0	0	0	U	U	U	U	U	0	0	0	0	0
Carbon Tetrachloride		X	U	S	S	M	S	0	S	U	U	U	U	S	M	S	S	S	S
Cedarwood Essence		0	0	0	0	0	0	0	0	U	St	U	U	M	0	0	0	0	0
Chlorine, dry		M	0	0	0	0	0	0	0	St	Sd	St	St	0	0	0	0	0	0
Chlorine, moist		U	0	0	0	0	0	0	0	Mt	Sd	St	Mt	0	0	0	0	0	0
Chloroacetic Acid		U	0	0	0	0	0	0	0	Sd	Mt	S	Sd	U	0	0	0	0	0
p-Chloroacetophenone		0	0	0	0	0	0	0	0	S	U	S	S	U	0	0	0	0	0
Chlorobenzene		0	0	U	U	0	S	0	0	U	U	U	U	0	0	S	0	S	0
Chloroform		X	U	M	S	M	S	0	U	U	U	U	U	U	S	S	M	S	S
Chlorosulphonic		M	0	0	0	0	0	0	0	M	0	M	M	0	0	0	0	0	0
Chromic Acid (5 %)		U	0	0	0	0	0	0	0	S	M	S	S	U	0	0	0	0	0
Chromic Acid (10%)		M	U	U	U	U	S	S	0	S	M	S	S	U	U	S	S	S	S
Chromic Acid (50%)		U	U	U	S	U	S	0	0	D	U	S	S	U	U	S	S	M	S
Cinnamon Essence		0	0	0	0	0	0	0	0	U	St	U	U	M	0	0	0	0	0
Citric Acid (10%)		S	S	S	0	M	S	S	M	S	S	S	S	S	S	S	S	S	S
Copper Nitrate		U	0	0	0	0	0	0	0	S	0	S	S	0	0	0	0	0	0

Chemical	Material	AL	BN	CAB	CN	DL	KY	NO	NY	PA	PC	PE	PP	PS	SS	TF	TZ	TI	VA
		PPCO																	
Copper Sulphate		U	0	0	0	0	0	0	0	S	0	St	S	0	0	0	0	0	0
Croesol		S	0	0	0	0	S	0	U	S	U	S	S	0	0	S	M	S	0
Cyclohexane		S	0	0	0	0	0	0	0	Mt	Sd	Mt	Mt	U	0	0	0	0	0
Cyclohexanol		S	0	U	0	0	0	0	S	S	M	S	S	0	0	S	0	S	0
Cyclohexanone		0	0	0	0	0	0	0	0	Mt	U	U	U	U	U	0	0	0	0
Cyclopentane		0	0	0	0	0	0	0	0	Mt	U	U	U	U	U	0	0	0	0
Decane		0	0	0	0	0	0	0	0	Mt	Mt	Mt	Mt	Sd	0	0	0	0	0
Dextran Sulphate		M	0	0	0	0	0	0	0	S	S	S	S	S	0	S	S	0	0
Diacetone		S	0	U	0	0	0	0	0	S	0	S	S	0	0	S	0	S	0
Diacetone Alcohol		S	0	0	0	0	0	0	0	S	0	S	S	0	0	0	0	0	0
o-Dichlorobenzene		0	0	0	0	0	0	0	0	Mt	U	Mt	Mt	U	0	0	0	0	0
p-Dichlorobenzene		0	0	0	0	0	0	0	0	Mt	U	Mt	Mt	U	0	0	0	0	0
Dichloroethane		0	U	U	U	S	0	S	S	U	U	U	U	0	0	S	S	S	S
Dichlorophenol		0	0	0	0	0	0	0	0	U	U	U	U	U	0	0	0	0	0
Diethylamine		S	0	0	0	0	0	0	0	St	U	U	St	Sd	0	0	0	0	0
Diethyl Benzene		0	0	0	0	0	0	0	0	U	Mt	U	U	U	0	0	0	0	0
Diethylene Glycol		S	S	S	S	S	S	0	U	S	S	S	S	S	0	S	S	S	S
Diethylene Glycol Ethyl Ether		0	0	0	0	0	0	0	0	S	Mt	S	S	M	0	0	0	0	0
Diethyl Ether		S	0	0	0	0	0	0	0	U	U	0	U	0	0	0	0	0	0
Diethyl Ketone		S	0	U	U	M	0	0	U	U	U	M	M	0	0	S	M	S	0
Dimethylacetamide		0	0	0	0	0	0	0	0	S	U	St	S	U	0	0	0	0	0
Dimethylformamide		S	0	0	0	0	0	0	0	S	U	S	S	0	0	S	M	S	0
Dimethylsulphoxide		S	0	0	0	0	0	0	0	S	U	0	S	0	S	S	M	S	0
Dioxane		S	U	U	0	M	S	0	0	M	U	M	M	0	0	S	S	S	U
Diphenyloxide		S	0	0	0	0	0	0	0	U	0	0	U	0	0	0	0	0	0
Dipropylene Glycol		0	0	0	0	0	0	0	0	S	Sd	S	S	S	0	0	0	0	0
Distilled Water		S	S	S	S	S	0	S	S	S	S	S	S	S	S	S	S	S	S
Ethanol (50%)		S	S	S	S	M	S	S	U	S	M	S	S	S	S	S	S	S	S
Ethanol (95%)		S	S	U	U	M	S	S	U	S	U	S	S	S	S	S	S	S	S
Ethyl Acetate		M	U	U	U	M	S	0	U	M	U	S	U	U	0	S	S	S	U
Ethyl Benzene		0	0	0	0	0	0	0	0	Mt	U	St	Mt	U	0	0	0	0	0
Ethyl Benzoate		0	0	0	0	0	0	0	0	Sd	M	S	Sd	U	0	0	0	0	0
Ethyl Butyrate		0	0	0	0	0	0	0	0	St	U	St	St	U	0	0	0	0	0
Ethyl Chloride		S	0	0	0	0	0	0	0	St	U	St	St	U	0	0	0	0	0
Ethylene Chloride		S	0	0	0	0	0	0	0	St	U	St	St	U	0	0	0	0	0
Ethylene Glycol		S	S	S	S	S	S	0	U	S	S	S	S	S	0	S	S	S	S
Ethylene Oxide		0	0	0	0	0	0	0	0	M	Mt	M	M	S	0	0	0	0	0
Ethyl Ether		S	0	U	U	0	0	0	0	M	U	M	M	0	0	S	M	S	0
Ethyl Lactate		0	0	0	0	0	0	0	0	0	S	St	S	S	M	0	0	0	0
Ethyl Malonate		0	0	0	0	0	0	0	0	0	S	Mt	S	S	M	0	0	0	0
Fatty Acids		S	0	0	0	0	0	0	0	Sd	Sd	Sd	Sd	S	0	0	0	0	0
Ferric Chloride		U	S	0	0	M	S	S	S	S	0	S	S	0	U	S	S	S	S
Ferric Nitrate		M	0	0	0	0	0	0	0	S	0	St	S	M	0	0	0	0	0
Ferric Sulphate		S	0	0	0	0	0	0	0	S	0	S	S	0	0	0	0	0	0
Ficoll Paque		M	0	0	0	0	0	0	0	S	S	S	S	S	0	S	S	0	0
Fluorine		S	0	0	0	0	0	0	0	Mt	Sd	St	Mt	U	0	0	0	0	0
Fluorhydric Acid (10%)		U	U	M	M	U	S	0	S	S	M	S	S	S	U	S	S	U	0
Fluorhydric Acid (50%)		U	U	U	U	U	S	0	0	S	U	S	S	M	U	S	S	U	M

Chapter 6

Hazards, Precautions and Limitations of Use

Chemical	Material	AL	BN	CAB	CN	DL	KY	NO	NY	PA	PC	PE	PP	PS	SS	TF	TZ	TI	VA
		PPCO																	
Formaldehyde (20%)	S	O	O	O	O	O	O	O	O	S	Sd	S	S	Sd	O	O	O	O	O
Formaldehyde (40%)	M	M	O	S	O	S	S	S	S	S	S	D	S	S	S	S	S	S	S
Formaldehyde (50%)	S	O	O	O	O	O	O	O	O	S	Sd	S	S	Sd	O	O	O	O	O
Formic Acid (100%)	S	M	U	O	U	S	S	U	S	M	S	S	O	U	S	S	S	S	U
Freon TF	U	O	O	O	O	O	O	O	Sd	Sd	Sd	Sd	Sd	O	O	O	O	O	O
Fuel Oil	O	O	O	O	O	O	O	O	Sd	Sd	Mt	Sd	Sd	O	O	O	O	O	O
Glucose	S	O	O	O	O	O	O	O	S	O	S	S	O	O	O	O	O	O	O
Glutaraldehyde	O	O	O	O	O	O	O	O	Sd	Sd	S	Sd	Sd	O	O	O	O	O	O
Glycerine	S	O	O	O	O	O	O	O	S	S	S	S	S	O	O	O	O	O	O
Glycerol	S	O	O	S	O	S	S	O	S	S	S	S	S	S	S	S	S	S	O
Heptane	S	O	O	O	O	O	O	O	M	O	S	M	O	O	O	O	O	O	O
Hexane	S	O	O	O	O	O	O	O	S	O	M	S	O	O	O	O	O	O	O
Hydrazine	O	O	O	O	O	O	O	O	U	U	U	U	U	O	O	O	O	O	O
Hydrochloric Acid (5%)	U	O	O	O	O	O	O	O	S	S	S	S	S	O	O	O	O	O	O
Hydrochloric Acid (37 %)	U	O	O	O	O	O	O	O	Sd	U	S	Sd	S	O	O	O	O	O	O
Hydrochloric Acid (50%)	U	U	U	U	U	S	S	O	M	U	S	M	O	U	S	S	S	S	M
Hydrochloric Acid (conc.)	U	U	U	O	U	O	O	O	S	U	O	S	O	U	S	S	S	S	O
Hydrofluoric Acid (10%)	U	U	M	M	U	S	O	S	S	M	S	S	S	U	S	S	U	O	O
Hydrofluoric Acid (50%)	U	U	U	U	U	S	O	O	S	U	S	S	M	U	S	S	U	M	M
Hydrogen Peroxide (3%)	S	M	S	S	S	O	S	S	S	S	S	D	S	S	S	S	S	S	S
Hydrogen Peroxide (100%)	S	U	S	S	U	O	S	O	S	S	S	D	S	S	S	S	U	M	M
Iodine, Crystals	S	O	O	O	O	O	O	O	Mt	U	U	Mt	U	O	O	O	O	O	O
Isobutyl Alcohol	O	M	U	O	S	O	O	U	S	S	S	S	O	O	S	S	S	S	S
Isopropyl Alcohol	U	M	U	U	S	O	S	U	S	M	S	S	M	O	S	S	S	S	S
Isopropylbenzene	O	O	O	O	O	O	O	O	Mt	U	Mt	Mt	U	O	O	O	O	O	O
Kerosene	S	O	O	O	O	O	O	O	Sd	S	Mt	Sd	St	O	O	O	O	O	O
Lactic Acid (20%)	O	S	O	O	O	O	S	O	S	S	S	S	S	S	S	S	S	S	S
Lactic Acid (100%)	O	S	O	O	O	O	O	O	S	S	S	S	O	S	S	S	S	S	S
Lead Acetate (aq.)	U	O	O	O	O	O	O	O	S	S	St	S	O	O	O	O	O	O	O
Lemon Essence	U	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Lime, (conc.)	M	O	O	O	O	O	O	O	S	U	S	S	S	O	O	O	O	O	O
Magnesium Chloride	M	O	O	O	O	O	O	O	S	S	S	S	S	O	S	S	O	O	O
Magnesium Hydroxide	U	O	U	O	O	S	S	O	S	U	S	S	O	O	S	O	S	O	O
Magnesium Nitrate	M	O	O	O	O	O	O	O	S	O	Sd	S	O	O	O	O	O	O	O
Magnesium Sulphate	S	O	O	O	O	O	O	O	S	O	St	S	O	O	O	O	O	O	O
Manganese Salts	M	O	S	O	O	O	O	O	S	O	S	S	O	O	S	O	S	O	O
Mercury	O	O	O	O	O	O	O	O	S	U	S	S	S	O	O	O	O	O	O
Methanol (100%)	S	S	U	U	M	S	O	U	S	M	S	D	S	S	S	S	S	S	U
Methyl Acetate	S	O	O	O	O	O	O	O	M	U	M	M	U	O	O	O	O	O	O
Methyl Alcohol (100%)	S	S	U	U	M	S	O	U	S	M	S	D	S	S	S	S	S	S	U
Methyl Butyl Ketone	O	O	O	O	O	O	O	O	U	O	O	O	O	O	O	O	O	O	O
Methyl Ethyl Ketone	S	U	U	U	M	M	O	U	S	U	S	S	U	O	S	M	S	U	U
Methyl Isobutyl Ketone	St	O	O	O	O	O	O	O	S	U	S	S	U	O	O	O	O	O	O
Methyl Isopropyl Ketone	O	O	O	O	O	O	O	O	U	U	S	U	U	O	O	O	O	O	O
Methylene Chloride	X	U	U	U	S	S	O	U	U	U	M	U	U	S	S	S	S	S	M
Mineral Oil	O	O	O	O	O	O	O	O	Mt	U	Mt	Mt	Mt	O	O	O	O	O	O
Nickel Chloride	U	O	O	O	O	O	O	O	S	O	St	S	O	O	O	O	O	O	O
Nickel Salts	M	S	S	O	O	O	O	S	S	S	S	S	O	S	S	S	S	S	S

Chemical	Material	AL	BN	CAB	CN	DL	KY	NO	NY	PA	PC	PE	PP	PS	SS	TF	TZ	TI	VA
		PPCO																	
Nickel Sulphate		U	0	0	0	0	0	0	0	S	S	St	S	0	0	0	0	0	0
Nitric Acid (10%)		M	U	S	S	U	S	S	M	D	S	S	S	S	D	S	S	S	S
Nitric Acid (20%)		U	0	0	0	0	0	0	0	S	Sd	S	S	St	0	0	0	0	0
Nitric Acid (50%)		M	U	M	M	U	S	S	M	D	M	M	M	0	D	S	S	S	S
Nitric Acid (95%)		M	U	U	0	U	0	0	U	M	U	U	M	U	S	S	S	S	S
Nitric Acid (conc.)		St	0	0	0	0	0	0	0	U	U	Mt	U	U	0	0	0	0	0
Nitrobenzene		0	0	0	0	0	0	0	0	U	U	U	U	U	0	0	0	0	0
Octane		0	0	0	0	0	0	0	0	S	Sd	S	S	Sd	0	0	0	0	0
Octyl Alcohol		S	0	0	0	0	0	0	0	0	0	S	0	0	0	0	0	0	0
Oleic Acid		S	U	S	S	S	S	0	S	S	S	S	S	S	S	S	S	S	M
Orange Essence		S	0	0	0	0	0	0	0	Mt	M	Mt	Mt	M	0	0	0	0	0
Oxalic Acid		M	M	S	S	0	S	0	S	S	S	S	S	S	S	S	S	M	S
Oxygenated Water (20%)		S	0	0	0	0	0	0	0	S	S	S	S	S	0	0	0	0	0
Oxygenated Water (50%)		S	0	0	0	0	0	0	0	S	S	S	S	S	0	0	0	0	0
Oxygenated Water (90%)		S	0	0	0	0	0	0	0	S	S	S	S	S	0	0	0	0	0
Ozone		0	0	0	0	0	0	0	0	Sd	Sd	S	Sd	S	0	0	0	0	0
Paraffin		S	0	0	0	0	0	0	0	S	0	S	S	0	0	0	0	0	0
Pentane		S	0	0	0	0	0	0	0	U	0	U	U	0	0	0	0	0	0
Perchloroethylene		S	0	0	0	0	0	0	0	U	U	U	U	U	0	0	0	0	0
Perchloric Acid		X	0	0	0	0	0	0	0	St	U	St	St	U	0	0	0	0	0
Perchloric Acid (10%)		U	0	0	0	U	S	0	0	S	U	M	M	0	U	S	S	S	S
Perchloric Acid (70%)		X	0	0	0	0	0	0	0	M	U	M	M	U	0	S	S	0	0
Petrol		S	0	0	0	0	0	0	0	St	M	St	St	M	0	0	0	0	0
Phenol (5%)		S	U	0	0	U	S	0	U	M	U	S	M	U	S	S	S	U	S
Phenol (50%)		U	0	0	0	0	0	0	0	U	U	U	U	U	0	S	M	0	0
Phenol, crystals		U	0	0	0	0	0	0	0	St	U	St	St	U	0	0	0	0	0
Phenol, liquid		U	0	0	0	0	0	0	0	U	U	U	U	U	0	0	0	0	0
Phenyl Ethyl Alcohol		0	0	U	0	0	0	0	S	S	0	S	S	0	0	S	0	S	0
Phosphoric Acid (10%)		0	M	S	S	U	S	S	0	S	S	S	S	S	S	S	S	0	S
Phosphoric Acid (conc.)		0	U	M	M	U	S	0	0	S	U	S	S	S	M	S	S	M	S
Picric Acid		S	0	0	0	0	0	0	0	U	U	U	U	U	0	0	0	0	0
Pine Oil		0	0	0	0	0	0	0	0	Sd	St	St	Sd	M	0	0	0	0	0
Potash, conc.		U	0	0	0	0	0	0	0	S	U	S	S	S	0	0	0	0	0
Potassium Bromide		U	0	0	0	0	0	0	0	S	S	S	S	0	0	0	0	0	0
Potassium Carbonate		M	0	S	S	0	S	S	S	S	U	S	S	0	S	S	S	S	0
Potassium Chlorate		M	0	S	S	0	S	S	S	S	S	S	S	0	S	S	0	S	0
Potassium Chloride		U	0	0	0	0	0	0	0	S	S	S	S	S	0	S	S	0	0
Potassium Hydroxide (5%)		U	M	S	M	U	0	0	S	S	U	S	S	S	S	S	S	M	S
Potassium Hydroxide (conc.)		U	M	U	U	U	0	0	0	S	U	S	S	0	S	S	S	U	M
Potassium Nitrate		S	0	0	0	0	0	0	0	S	0	S	S	0	0	0	0	0	0
Potassium Permanganate		S	0	0	0	0	0	0	0	S	S	S	S	D	0	S	S	0	0
Propane Gas		S	0	0	0	0	0	0	0	U	St	U	U	M	0	0	0	0	0
Propionic Acid		0	0	0	0	0	0	0	0	Sd	U	M	Sd	S	0	0	0	0	0
Propyl Alcohol		S	0	0	0	0	0	0	0	S	0	St	S	0	0	0	0	0	0
Propylene Glycol		S	0	0	0	0	0	0	0	S	Sd	S	S	S	0	0	0	0	0
Propylene Oxide		0	0	0	0	0	0	0	0	S	St	S	S	S	0	0	0	0	0
Pyridine		U	0	0	0	0	0	0	0	M	U	S	M	0	0	0	0	0	0
Resorcinol, Sat'd., Sol		0	0	0	0	0	0	0	0	S	Sd	S	S	U	0	0	0	0	0

Chapter 6

Hazards, Precautions and Limitations of Use

Chemical	Material	AL	BN	CAB	CN	DL	KY	NO	NY	PA	PC	PE	PP	PS	SS	TF	TZ	TI	VA
		PPCO																	
Rubidium Bromide	M	0	0	0	0	0	0	0	0	S	S	0	S	0	0	0	0	0	0
Saccharose	U	0	0	0	0	0	0	0	0	S	S	S	S	S	0	0	0	0	0
Salicylic Acid, Sat	0	0	0	0	0	0	0	0	0	S	Sd	S	S	S	0	0	0	0	0
Serum	S	0	0	0	0	0	0	0	0	S	S	S	S	S	0	S	S	0	0
Silver Acetate	0	0	0	0	0	0	0	0	0	S	Sd	S	S	S	0	0	0	0	0
Silver Nitrate	U	0	0	0	0	0	0	0	0	S	S	S	S	S	0	S	S	0	0
Sodium Acetate	S	0	0	0	0	0	0	0	0	S	Sd	S	S	S	0	0	0	0	0
Sodium Bisulphate	M	0	S	S	0	S	S	S	S	S	S	S	0	S	S	0	S	0	0
Sodium Borate	M	0	0	0	0	0	0	0	0	S	S	Sd	S	0	0	0	0	0	0
Sodium Bromide	U	0	0	0	0	0	0	0	0	S	S	0	S	0	0	0	0	0	0
Sodium Carbonate (2%)	M	S	S	S	S	S	S	S	S	S	S	D	0	S	S	S	S	S	S
Sodium Chloride (10%)	S	S	S	S	S	0	0	S	S	S	S	S	S	S	S	S	S	M	S
Sodium Chloride (Sat'd.)	S	S	0	0	S	0	0	S	S	0	S	S	0	S	S	S	S	S	S
Sodium Hydroxide (>1%)	U	M	S	S	U	S	0	S	S	U	S	S	S	S	S	S	S	S	S
Sodium Hydroxide (10%)	U	M	U	U	U	S	0	S	S	U	S	S	S	S	S	S	S	S	S
Sodium Hydroxide (conc.)	U	M	U	U	U	0	0	0	M	U	S	M	0	S	S	S	M	U	U
Sodium Hypochlorite (5%)	M	M	S	S	U	S	S	S	D	S	S	S	S	M	S	S	S	S	S
Sodium Iodide	M	0	0	0	0	0	0	0	0	S	S	0	S	0	0	0	0	0	0
Sodium Nitrate	S	0	0	0	0	0	0	0	0	S	0	Sd	S	0	0	0	0	0	0
Sodium Sulfate	S	0	0	0	0	0	0	0	0	Sd	0	Sd	Sd	0	0	0	0	0	0
Sodium Sulphide	S	S	S	0	0	S	0	S	S	U	S	S	0	S	S	S	M	S	S
Stearic Acid	S	0	0	0	0	0	0	0	0	S	Sd	S	S	S	0	0	0	0	0
Sulphuric Acid (10%)	M	U	S	S	U	S	S	S	S	M	S	S	S	U	S	S	S	S	S
Sulphuric Acid (20%)	U	0	0	0	0	0	0	0	0	Sd	Sd	S	Sd	S	0	0	0	0	0
Sulphuric Acid (50%)	U	U	U	U	U	S	S	U	S	S	S	S	S	U	S	S	M	S	S
Sulphuric Acid (conc.)	U	U	U	U	U	S	0	U	D	U	M	D	U	M	S	S	U	S	S
Sulphuric Anhydride, dry or moist	S	0	0	0	0	0	0	0	0	S	Sd	S	S	S	0	0	0	0	0
Tetrachloroethane	M	0	0	0	0	0	0	0	0	M	0	0	M	0	0	0	0	0	0
Tetrachlorethylene	0	0	0	0	0	0	0	0	0	U	0	S	U	0	0	0	0	0	0
Tannic Acid	M	0	0	0	0	0	0	0	0	S	0	Sd	S	0	0	0	0	0	0
Tartaric Acid	M	0	0	0	0	0	0	0	0	S	Sd	S	S	S	0	0	0	0	0
Tetrahydrofuran	S	0	0	0	0	0	0	0	0	U	U	U	U	U	0	S	S	0	0
Thionyl Chloride	0	0	0	0	0	0	0	0	0	U	U	U	U	U	0	0	0	0	0
Toluene	S	U	P	S	M	S	0	U	U	U	U	U	U	U	S	S	S	M	M
Trichlorethylene	S	U	0	0	0	S	0	U	U	U	U	U	U	U	U	S	S	M	S
Trichloroacetic Acid	U	0	0	0	0	0	0	0	0	Mt	Mt	Mt	Mt	S	0	0	0	0	0
1,2,4 - Trichlorobenzen	0	0	0	0	0	0	0	0	0	U	U	U	U	U	0	0	0	0	0
Trichloroethane	S	U	S	0	M	S	0	S	U	U	U	U	M	0	S	S	S	S	S
Triethylamine	0	0	0	0	0	0	0	0	0	U	0	0	U	0	0	0	0	0	0
Triethylene Glycol	0	0	0	0	0	0	0	0	0	S	Sd	S	S	S	0	0	0	0	0
Tris Buffer (neutral)	S	0	0	0	0	0	0	0	0	S	S	S	S	S	0	S	S	0	0
Trisodium Phosphate	0	0	S	0	M	0	0	S	S	0	S	S	0	0	S	S	S	S	S
Triton X-100	S	0	0	0	0	0	0	0	0	S	S	S	S	S	0	S	M	0	0
Turpentine	S	0	0	0	0	0	0	0	0	Sd	Mt	St	Sd	U	0	0	0	0	0
Undecyl Alcohol	0	0	0	0	0	0	0	0	0	Sd	Sd	St	Sd	M	0	0	0	0	0
Urea	M	0	S	S	S	0	0	S	S	S	S	S	S	S	S	S	S	S	0
Urine	0	0	S	0	S	0	0	S	S	S	S	S	0	0	S	S	S	S	0
Vinylidene chloride	0	0	0	0	0	0	0	0	0	U	U	U	U	U	0	0	0	0	0

Chemical	Material	AL	BN	CAB	CN	DL	KY	NO	NY	PA	PC	PE	PP	PS	SS	TF	TZ	TI	VA
		PPCO																	
Xylene		S	U	P	O	M	S	O	U	U	U	U	U	U	S	S	S	S	S
Zinc Chloride		M	S	S	O	O	O	O	S	S	S	S	S	S	M	S	S	S	S
Zinc Hydrosulphite		U	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Zinc Sulphate		U	O	O	O	O	O	O	O	Sd	O	S	Sd	O	O	O	O	O	O

* This table is intended as a guide only because of the difficulty in quantifying, cross-checking and monitoring the results under different conditions of temperature, pressure and purity relating to the solvents and samples dissolved therein. It is strongly recommended that you carry out your own trials, particularly before protracted work periods.

Limitations

The Thermo Espresso centrifuge and its rotors offer a high level of RCF performance. In some cases the maximum possible RCF will exceed the one sustainable by the sample container.

The rotor RCF performance displayed is the maximum available in the rotor pockets.

Depending on the sample containers or on other application needs, the maximum RCF which must be used is to be determined by the operator.



The centrifuge is not explosion proof.

Using this centrifuge with explosive samples is entirely at the user's own risk. Do not under any circumstances use the centrifuge in an explosive environment. ▲

Aerosol Risks

Due to the action of the turbulence created in the bowl, a centrifuge is an aerosol generator.

In the case of samples presenting a biological or chemical risk, the operator must take suitable precautions to prevent or reduce this risk.

The following information should be given to all users including those persons using the equipment infrequently:

A ventilated centrifuge (like the Thermo Espresso) exhausts, into the room, air which has passed through its bowl. Thus the risk of the spread of aerosols is significant in a ventilated centrifuge.

Aerosols are produced naturally when using uncapped tubes or bottles. They are also produced when a container deforms or breaks provoking a small or large sample leak.

We draw your attention to the use of tubes in angle rotors. Even if the liquid level does not touch the cap when in a static state, it could do so during centrifugation and leak. You should therefore follow the instructions of the tube supplier concerning the fill level and sealing of the tube.

Once a biological risk is known or suspected, samples should be placed in a sealed container. Should such containers not be available, sealed accessories should be used, such as angle rotors with sealed lids.

Duration of aerosol presence

When aerosols are created in a centrifuge bowl, they persist in the air for a period of 3-5 minutes after the rotor stops moving. Indeed, the action of opening the lid itself causes the dispersion of aerosols into the environment.



When an elevated risk of aerosols or of breakage is perceived the accessories should be handled using gloves and opened in an environment **ensuring the protection of the operator** (safety cabinet, glove chamber, wearing a mask ...), even if they are apparently sealed. ▲

Chapter 7 Maintenance

Periodic Cleaning



All cleaning operations should be performed with the centrifuge disconnected from the power outlet. ▲

Daily

No daily cleaning is required, except in the case of accidental tube breakage, or when there is a large amount of spillage in the bowl.

Weekly

Clean the bowl and the accessories with a cotton wool pad dipped in 70% alcohol.

Never use metallic brushes to clean accessories.

After cleaning the accessories, always rinse them with clean water and dry them.

Fuse Replacement

Changing of fuses on the Thermo Espresso must not be carried out by the operator but by a Thermo Service representative who will diagnose any possible fault before replacing the fuses.

Power supply Circuit Breaker

If the main circuit breaker cuts off the power to the instrument, do not attempt to switch it on before a Thermo Service representative has checked over the unit.

Certificate of Decontamination and Cleaning



Read carefully the instructions below before sending an instrument, or parts of it, to Thermo Service Dept. or to any Authorized Technical Assistance Service. ▲

Mr / Mrs (name) Establishment
Department
Address Post / Zip code
City State / Country

Declares the cleaning and decontamination of the following:

Product type Serial N°
Rotor Serial N°
Rotor Serial N°
Accessory - Description Serial N°
Accessory - Description Serial N°

Nature of contamination

.....
.....

Decontamination Procedure used

.....
.....

Decontamination certified by:

Mr / Mrs Institution
Date Signature

When an instrument, or parts of it, requires servicing by Thermo personnel, the following procedure must be accomplished to ensure personnel safety:

- Clean the instrument and proceed to its decontamination from any kind of dangerous products.
- Compile this Decontamination Certificate with all the information required.

Certificate of Decontamination and Cleaning

- Attach this Certificate to the instrument (or part) before sending it to Thermo Service or other authorized technical service.

Thermo personnel will not accept to work on instruments deprived of this Decontamination Certificate.

If an instrument is received at our Service facilities and, in our opinion, is a radioactive or biological hazard, the item will be refused and resent to the Customer. Disposition costs will be borne by the sender.

Instructions for decontamination and cleaning are explained in the User Manual. Additional certificates are available from your local technical or Customer Service representative. In the event these certificates are not available, a written statement certifying that the instrument or part has been properly decontaminated and outlining the procedures used will be acceptable.

For your convenience, use a copy of this page

