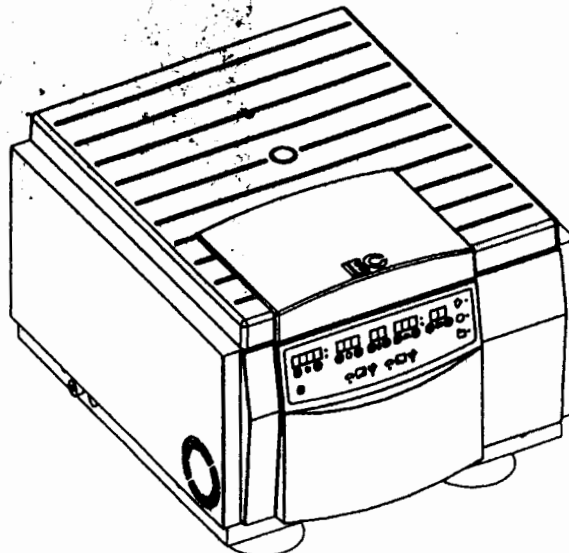


IEC

OPERATION MANUAL OM3750

Revision 0



Centra-CL3 Series

Centra-CL3 Ventilated Centrifuge

Cat. No. 3750 -- 120 VAC, 60 Hz

Cat. No. 3751 -- 220, 230, 240 VAC, 50/60 Hz

Centra-CL3R Refrigerated Centrifuge

Cat. No. 3755 -- 120 VAC, 60 Hz

Cat. No. 3756 -- 220, 230, 240 VAC, 50 Hz

Cat. No. 3757 -- 230 VAC, 60 Hz



IEC

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1 Introduction

1.1 General Product Description

Centra-CL3 series units are high-speed, multipurpose centrifuges, used in medical, industrial, and scientific applications.

The CL3 Series is available in two versions: ventilated (Centra-CL3) and refrigerated (Centra-CL3R). Sections of this manual that apply to the refrigerated version will be designated Centra-CL3R or refrigerated only.

Both units accommodate a wide variety of rotors, including fixed angle, swinging bucket, and fixed horizontal designs. They can process tubes, bottles, microplates, microcapillary tubes, cytological slide carriers, and microsample tubes. The units can centrifuge up to one liter of fluid in a single operation.

Each centrifuge has an easy to use front panel that provides two modes of operation: **Manual** and **Programmed**.

Manual mode is used for entering temperature (CL3R only), speed/force, and time values for individual runs.

Program mode allows you to define and save a maximum of ninety-nine specific sets of run parameters, to recall and reuse.

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The CL3 Series features a maintenance-free, brushless motor, and an easy-to-use front panel, which provides three versatile timing modes: automatic timed run, momentary spin, and continuous operation (hold mode). Acceleration and brake rates may be controlled, to optimize runs: rapid for fast separations or slow for delicate samples. Repeat runs, with the same speed and time settings, may be achieved at the touch of a key.

A fail-safe cover interlock insures that the cover is closed, before a run can begin, and keeps the cover closed, until the rotor has reached a safe low speed (below 100 rpm), even in the event of a power failure.

The rugged steel cabinet and rigid construction provide quiet operation and long term reliability.

1.2 About This Manual

The Operations Manual contains all of the information needed to install, operate, and maintain a CL3 Series centrifuge. Refrigerated and ventilated models operate similarly, and any differences are highlighted and noted, throughout this manual. This manual, also, contains speed and force, derating, chemical resistance, and decontamination tables. The last chapter lists the units' specifications.

This manual is written for centrifuge operators. In addition to operation information, it contains a few basic troubleshooting techniques, and a chapter on maintenance. This **Operation Manual** is not a guide for servicing centrifuge units.

1.3 Warnings, Cautions, and Notes

The terms **warning**, **caution**, and **note** have specific meanings in this manual.

- A **Warning** advises against certain actions or situations that could result in personal injury.
- A **Caution** advises against actions or situations that could damage equipment, produce inaccurate data, or invalidate a procedure.
- A **Note** provides useful information regarding an operation, function, or procedure.

2 Installation

2.1 Receiving the Unit

International Equipment Company (IEC) ships the centrifuge in a carton that protects it from shipping hazards. Follow the unpacking instructions on the carton. Be sure to complete and return the postage-paid warranty card.

2.2 Site Preparation

The unit normally resides on a bench top. The Centra-CL3 (ventilated model) can be placed in a cold room (no colder than 0°C), for processing temperature-sensitive samples. When you remove the centrifuge from a cold environment, do not operate for a minimum of two hours, so that any condensation will evaporate.

Note: When used in a cold room environment, some bearing noise may become evident. The bearing lubricant thickens at low temperatures. As the centrifuge speeds up, it is thinned and distributed more evenly. Once this occurs, any noise should subside.

The following table lists the physical dimensions for the Centra-CL3 and Centra-CL3R:

	CL3R	CL3
Sample Loading Height	12.5" (32 cm)	12.5" (32 cm)
Cover Closed Height	14.5" (37 cm)	14.5" (37 cm)
Cover Open Height	33" (84 cm)	33" (84 cm)
Width	26.5" (68 cm)	19.25" (49 cm)
Depth	21" (53 cm)	21" (53 cm)

A clearance of 8 cm (3 inches) should be provided on each side of the unit, to ensure proper ventilation. Place the centrifuge on a clean, dry surface, to make certain that the suction feet at the bottom grip the surface firmly. Keep the area beneath the unit free of debris and loose materials.

The resting surface must be level, to ensure quiet, vibration-free operation. A rigid and stable location is important. An improperly loaded centrifuge may vibrate or move.

Warning: International Electrotechnical Commission standard 1010 part 2-20 limits the permitted movement of a laboratory centrifuge to 300 mm (12 in) in the unlikely event of a disruption. Laboratory management procedures should require that no person or any hazardous materials enter within this boundary while the centrifuge operates.

2.3 Power Configuration

The CL3 Series uses AC power in different configurations, appropriate for use throughout the world. Please check the catalog number of the model that you have purchased, to ensure that the machine you have is the proper power configuration. For best results, the refrigerated centrifuge, Centra-CL3R, should be used on a dedicated line. Variations in line voltage or frequency affect the unit's speed and other characteristics. Less than nominal line voltage may prevent the centrifuge from reaching maximum published specifications of speed and/or temperature. Power line voltage, at some locations, may sag, when the refrigeration system turns on.

Power Cord

The unit requires a grounded power supply (3 prong outlet). If your facility does not have grounded power outlets, arrange for a proper grounding. The power cord plugs in on the left rear side of the unit.

Warning: Do not remove the grounding pin from the centrifuge power cord. Do not use the bare wired power cord to attach a power plug that does not have a grounding pin.

The power cord provided with the unit is correctly rated for the highest current demand. This power cord should not be interchanged with cords from equipment with lower current demand. Exchange of power cords between equipment may create a fire hazard.

Circuit Breaker

The system provides an automatic circuit breaker, for emergency situations, such as power surges, that could damage the unit.

If the circuit breaker trips:

1. Unplug the unit.
2. Press the white button, on the left side of the unit.
3. Plug the unit back in.

2.4 Moving the Unit

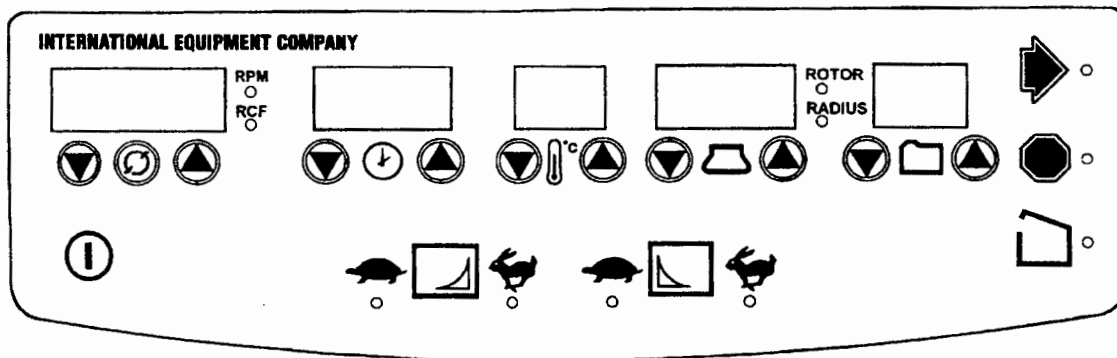
Suction cups, at the bottom of the unit, keep it anchored to the work surface. Keeping the unit stationary is a safety feature.

To move the unit to a new location:

1. Check that the new site meets the criteria in Section 2.2., before moving the unit.
2. Position a flat object, such as a tongue depressor, near a suction cup at the bottom of the unit.
3. Lift up an edge of the cup, and insert the flat object far enough to break the vacuum seal.
4. When all four cups are disengaged, lift the unit from the work surface.

Caution: When the unit is in its new location, ensure that the suction cups adhere correctly to the work surface.

2.5 The Front Panel



The Front Control Panel
(Centra-CL3R)



On/Off key: The **On/Off** key must be activated, to enable use of the front panel. This key applies power to the control panel and refrigeration system (Refrigerated model only). The **On/Off** key is inoperative during actual runs. Stop a run with the **STOP** key. Refrigerated models display chamber temperature whenever they are plugged in, but will not cool down if the unit is off. The red **STOP** light indicates that the centrifuge is plugged in.

The control panel contains numeric displays for RPM/RCF (Speed/Force), Time, and Temperature (Refrigerated only). These displays have two states or modes: Actual (bright display) and Set (dim display).

In Actual mode (bright display), they indicate current run conditions, such as:

- rotor speed or force
- elapsed time of, or time remaining in, the run
- actual temperature (Refrigerated only).

In Set mode (dim display), the display indicates the desired settings for the run. Set mode is operative:

- whenever you use the up and down arrows
- briefly, at the start of a run
- briefly, after the unit is switched **ON**

The display is bright, when it shows Actual run conditions. The display is dim, when it shows Set parameters. The numeric displays can, also, display warning or error messages (see Section 3.5). Descriptions of the displays appear on the following pages.



Speed/Force display: The number in the speed/force display (above this symbol) represents the rotor speed in RPM or force in RCF. Press this symbol to toggle between RPM and RCF. When RPM is selected, the display indicates revolutions per minute. When RCF is selected, the display indicates relative centrifugal force. Use the arrow keys to change the set speed or force. The display shows speed within 50 RPM. It never requires calibration. Select speed in increments of 100 RPM, from 1,000 through 8,500 RPM. Select RCF in increments from 1 - 1,000 xg by 50 xg and above 1,000 xg by 100 xg. The numeric display can, also, display warning or error messages (see Section 3.5).



Time display: The number in the display (above this symbol) indicates time. Below ten minutes, time is displayed as minutes:seconds. Above ten minutes, just minutes are displayed.

Time is set in:

- 1 second increments, from 1 - 59 seconds.
- 15 second increments, from 1 - 5 minutes.
- 1 minute increments, from 5 - 99 minutes.

In normal timed mode, the system counts down from the set point. In time **Hold** or momentary spin modes, the system counts up.

In At-Start mode, the timer begins counting at the start of a run. In At-Speed mode, the timer begins counting when the rotor reaches 95% of the set speed.



Temperature display: The number in the display (above this symbol) represents temperature in degrees Celsius, from - 9 °C through + 40 °C (Refrigerated only).



Program key: This key saves the currently displayed desired settings as stored programs 1 through 99 (see Section 3.3). The numeric display (above this symbol) shows the stored program number and mode of operation (see Section 3.2).



Rotor/Radius Key: The display (above this symbol) indicates the selected rotor number or the rotor radius, in centimeters. The rotor/radius key toggles between the two displays. The applicable IEC rotor numbers are supplied in the memory, along with their maximum radii, in centimeters. To select a rotor number, toggle to ROTOR, and press an arrow key under the rotor/radius display. To change the radius, toggle to RADIUS, and press an arrow key under the rotor/radius display. Note that the radius cannot be changed to a radius larger than the maximum radius, or less than the minimum radius, for the selected rotor.



Use the arrow keys to view or change the Set parameters for Speed/Force, Time, Temperature (Refrigerated only) Rotor/Radius, or Program. The first time the key is pressed, the numeric display switches from Actual readings to Set parameters, without changing them. If you press the key a second time, the selected parameter increases or decreases once for each depression. If you hold the key down, the setting will keep changing, until you release the key.

The longer you hold the key, the more rapidly the setting changes. Hold a key down, to approach a desired setting. Then, press the up or down key, repeatedly, to select the exact setting. When you release the arrow keys for 3 seconds, the display returns to the Actual readings.

Acceleration and Braking

Gentle acceleration and braking can be selected, when centrifuging delicate samples. The gentle settings avoid mixing of density gradients or breakup of pellets.



This key controls rotor acceleration up to 400 RPM. If the yellow light over the rabbit is lit, full acceleration is selected. If the yellow light over the turtle is lit, slow acceleration is selected. Slow acceleration takes from 15 to 35 seconds to achieve 400 RPM, depending on the rotor and its contents. After 400 RPM, full acceleration is applied, until the set speed is reached.



This key controls rotor braking. If the yellow light over the rabbit is lit, full braking is selected. If the yellow light over the turtle is lit, slow braking is selected. (This means the rotor will coast down from 600 RPM.) If both lights are out, all braking is disabled; and the rotor will coast from operating speed to a stop.



This key starts a run. A run is governed by the Set parameters (manual or programmed). The associated green light blinks, until the rotor reaches 95% of the set run speed. The light stays on until the end of the run.



This key stops a run. (A run will, also, stop automatically when the set time has elapsed or the start key is released, in momentary mode.) The red light will flash, to indicate the rotor is still slowing down (braking or coasting). When the run ends, the red light stays on, indicating that the rotor has stopped.



This key unlocks the cover. This key is inoperative if a run is in progress. Pressing it will not stop the run. The cover will not unlock, until the rotor has slowed to below 100 rpm. The cover will open automatically, on ventilated units only, at the end of a run.

3 OPERATION

3.1 Rotor and Accessories

A balanced load is essential for all centrifuges. An unbalanced load produces vibration, and can damage the unit. A 2 gram load imbalance, at a speed of 4600 RPM, imparts force equivalent to 9.1 kg (20 pounds) at rest. Always ensure that the rotor is loaded symmetrically, with a full complement of accessories, and a full (or paired) set of tubes. Tube adapters should also be installed symmetrically.

IEC rotors are dynamically balanced at the factory. IEC matches removable parts (trunnion rings, shields, buckets, and carriers) to within 1 gram, and stamps the weight on each piece. Check these markings, whenever you interchange parts, to ensure that opposite parts are matched. Ensure that the total weight of samples and removable parts, loaded in opposing positions, are equal in weight, to within 1 gram. The position numbers, present on many rotors and adapters, identify opposing tube positions.

To obtain good dynamic balance, opposite loads must not only be equal in mass, but must, also, have the same centers of gravity. Opposing containers must be alike in shape, thickness, and distribution of glass or plastic. This is especially important for large containers.

Tubes loaded into swinging bucket rotors must be symmetric, around the axis of rotation. Verify this by rotating the entire rotor 180°, by hand. The loads should be in the same apparent positions (not mirror images). In addition, the loads within each bucket must, also, be symmetric around the bucket's pivot axis. Verify this by ensuring that each bucket is loaded so that it does not tilt from the vertical, when the rotor is at rest. Maintaining balance within each bucket ensures that the bucket and the tubes swing out to horizontal, when the rotor reaches operating speed, applying centrifugal force toward the bottom of the tubes. Failure to achieve full swing-out causes vibration and premature wear of the rotor and the motor.

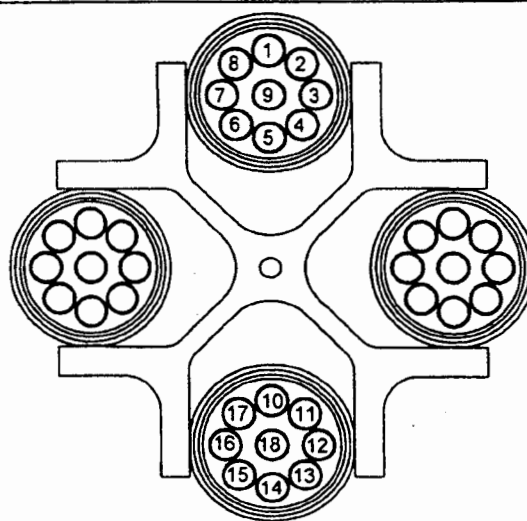
Samples of like (similar) specific gravities may be processed in the same run, provided that the samples of the same type are balanced around the rotor, as though they were the only pairs in the rotor.

Caution: Do **not** exceed maximum rated speed for each rotor/accessory combination. Maximum rated speeds can be found in Section 4.2 - **Speed And Force Tables**.

Rotor Balance

Load tubes in the following manner:

1. Load two tubes at positions:
9 and 18.
2. Load four tubes at positions:
1, 5 and 10, 14
or
7, 3 and 16, 12
3. Load six tubes at positions:
1, 9, 5 and 14, 18, 10
or
7, 9, 3 and 12, 18, 16
4. Loading an odd number of tubes is not recommended.



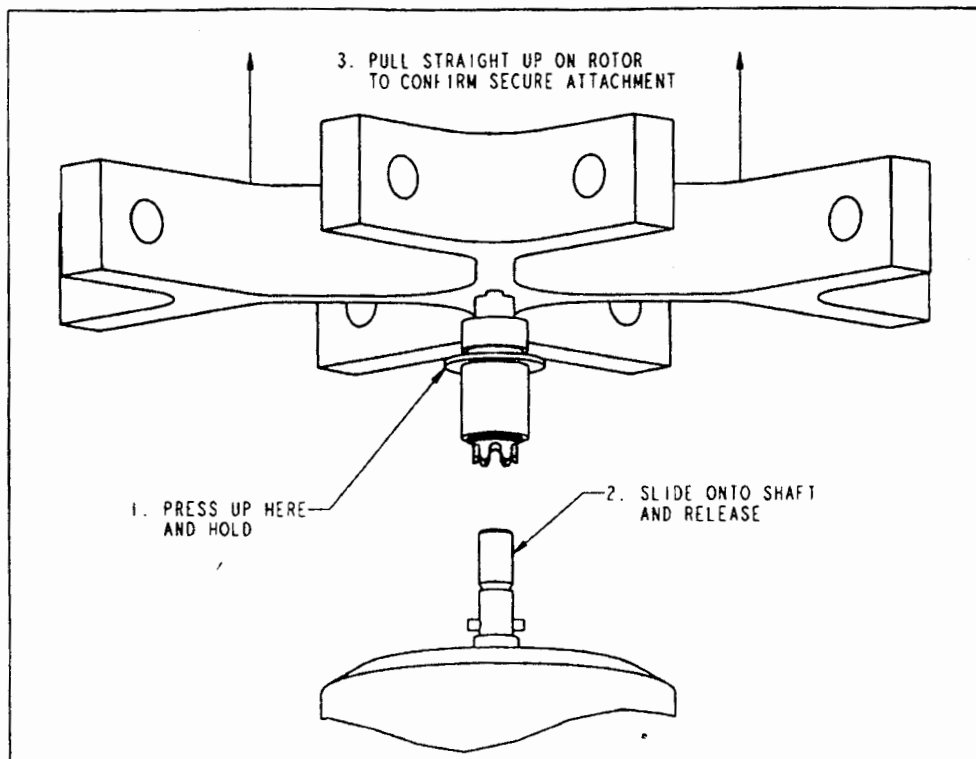
Vibration

All centrifuges have critical speeds, at which vibration occurs. As the speed increases, beyond the critical speed, vibration will cease. This inherent condition, also, occurs during deceleration. An imbalanced load intensifies these critical vibrations. **Do not continuously operate this centrifuge at observed critical speeds.**

Rotor Installation

To install the #243 rotor:

1. Press the disk (located on the underside of the rotor) to the rotor.
2. Slide the rotor over the shaft, until it snaps into place. Release the disk.
3. **Pull the rotor straight up, to insure a positive lock.**



Rotor Removal

To remove the 243 rotor:

1. Press the disk (located on the underside of the rotor) to the rotor.
2. Lift the rotor straight up.
3. Release the disk.

Rotor Adapter

To install the shaft adapter for an existing rotor:

1. Press the adapter disk, and slide the adapter over the rotor shaft. Release the disk.
2. Pull the adapter straight up, to insure a positive lock.
3. Align the rotor keyway with the key on the shaft adapter, and place the rotor onto the adapter.
4. Tighten the rotor locking nut (with the provided wrench), until it tightly engages the rotor.

To remove existing rotors from the shaft adapter:

1. Remove any sample tubes, shields, buckets, and other accessories, from the rotor.
2. Unscrew and remove the locking screw.
3. Grasp the rotor, and rock it front-to-back, and side-to-side.
4. Remove the rotor from the shaft.

3.2 Starting and Stopping a Run

Read Section 2.5, for a general description of the front panel. The settings displayed on the front panel always govern the operation of the unit. The number or symbol, above the Program icon, shows the unit's operating mode. It is important that the unit be in the correct mode for the desired operation.

These digits and symbols are displayed above the program icon. They can be any of the following:

blank The unit is in **manual operation**.

1-99 The unit is under control of the displayed **stored program** number.

C The unit is set to **Rapid Condition**, a special program discussed in Section 3.4.

The display indicates the last parameters selected for each Program mode operation.

Manual Operation

For manual operation, set the mode so that the display above the Program icon is blank. Select the desired temperature (CL3R only), speed/g-force, run time, acceleration mode, and braking mode. Press **START**, to start the spin.

The minutes display counts down, and displays the time remaining in the current spin, during manual operation.

The specified run time begins when the **START** key is pressed, or when the rotor reaches 95% of set speed (see Timing Mode). Braking begins when the elapsed time reaches this desired setting. Run time does **not** include braking time.

The spin will stop automatically, at the end of the desired interval. A run can, also, be stopped, at any time, by pressing the **STOP** key.

The settings can be changed during a manual run. These changes affect the run in progress. If the time setting is changed, during a run, the unit adjusts the count-down timer, to display the revised setting as the total time of the run. If the new time selected is less than the elapsed time, the run will end.

The unit's mode (settings) cannot be changed during a program mode spin.

Timing Mode

Four timing modes are available on these units: To select a timing mode, press the down arrow, under the time display, until the time goes below zero, and the appropriate symbol is displayed.

Momentary Mode (--- - Momentary spin is useful for easily separated samples, for simultaneous mixing of samples, and to deposit condensate droplets at the bottom of the tube.

For momentary spin, set the mode so that three dashes (---) appear above the Clock icon. Select temperature (CL3R only), speed/g-force, acceleration mode, and braking mode, as for manual operation.

Press and hold the **START** key. The run starts when you press the key, and ends when you release the key. In this mode, you can perform very quick separations or protocols.

During a momentary spin, the unit displays actual values, not desired settings. The time display counts upward, and displays the elapsed time since the **START** key was pressed.

Hold Mode (HLd) - For hold mode (operation without preset time limit), set the mode so that **HLd** appears in the Time display.

Select temperature (CL3R only), speed/g-force, acceleration mode, and braking mode, as with manual operation. Press and release the **START** key. The run starts when you press the key, and stops only when you press the **STOP** key. Hold mode is like manual operation, except that the time setting is not used. During a run in hold mode, the time display counts upward, and displays the elapsed time of the spin.

At-Start Mode (ACC) - The set time will start counting down at the beginning of acceleration (when the start key is pressed). The unit is originally set to this mode.

At-Speed Mode (SPd) - The set time will start counting down, when the rotor has reached 95% of set speed. The display will alternately show the set time and SPd, during acceleration to 95% of the set speed.

To select a timing mode, press the Time down arrow key, and scroll below 0 minutes. **ACC**, **SPd**, **HLd**, or **---** will appear. Press and release the Time down arrow key, to choose the desired mode. After three seconds, or after pressing the **PROGRAM** or **START** keys, the display will return to the last selected run time, provided the up arrow key has not been pressed.

The timing mode is stored along with the other parameters, when a program is saved. If a saved program has been recalled, altered, and not re-saved, the timing mode will revert back to the previous mode, when recalled.

3.3 Stored Programs

The CL3 Series has an internal memory capable of holding 99 sets of run parameters. Each set, or program, is stored and can be recalled by selecting a program number (from 1-99). Programs are retained in memory, even if the power is turned off. When necessary, a program can be modified for a particular run or changed permanently. You **cannot** change the unit's program, rotor/radius, or timing modes, during a spin.

Lock Program

Programs can be locked by scrolling to the desired program, and pressing the **PROGRAM** key three times. When you scroll to a locked program, the letter **L** will flash in the program display, after the program number is displayed. To unlock a program, scroll to the desired locked program and press the **PROGRAM** key three times. Parameters of locked programs cannot be changed.

Recall Program

Press a program arrow key, to select the appropriate program number.

The program's set parameters will be displayed. Press **START**, to begin this run.

Add/Change Program

Select a program number with the program arrow keys. The current program parameters will appear on the display. Modify the desired parameters, using the parameter arrow keys, or the **ACCEL** or **BRAKE** keys. The program number will flash, indicating that the program was changed, and has not, yet, been saved. Make the changes permanent by pressing the Program Save (file folder) key. The program number will stop flashing, and the new program settings will be displayed. The program will remain in memory, until further changes are made.

To make changes temporary, press **START**, without pressing the PROGRAM SAVE (file folder) key. The program display will flash, to indicate that the values are now stored in the manual program, and that the instrument is not currently operating from program mode. The original program will remain unchanged, as long as the PROGRAM SAVE (file folder) key is not pressed.

3.4 Centra-CL3R Refrigeration

Refrigerated units refrigerate the rotor chamber whenever the cover is closed and the unit is switched on.

Refrigeration is applied, as necessary, to cool the rotor chamber to the currently displayed temperature setting. If you use the keyboard, and momentarily display a cold temperature (stepping through stored programs, for example), refrigeration will not be activated.

If a temperature, higher than ambient, is specified, the unit will warm the rotor chamber by wind friction of the rotors and accessories, while spinning (see Rapid Condition).

If the rotor chamber is not at the specified temperature, it will not abort the spin. However, if the rotor chamber differs, at the start of a run, by more than 5°C, from the specified temperature. The °C display will switch between the actual and set/programmed temperatures, until the two temperatures come within 5°C. Press the **STOP** key, if the run should not continue at the actual temperature.

The unit is not designed for use as a refrigerator. The natural fanning action of the rotating horizontal and fixed angle rotors serves to maintain a uniform temperature distribution, inside the chamber. At zero RPM, there is no correlation between set and actual chamber temperatures.

Any frost or condensation, that forms in the rotor chamber, should be removed. Allow it to melt, and remove it with a sponge or cloth. When the centrifuge is not in use, turn it off, or leave the cover open (to disable refrigeration).

Rapid Condition

When the chamber temperature (CL3R only) is above the set temperature, Rapid Condition will run a rotor at 500 rpm, to increase air circulation in the chamber, to quickly cool the chamber to the set point. When the chamber temperature is below the set temperature, Rapid Condition will run the rotor at 2800 rpm, to warm the chamber to the set temperature. When the temperature has been reached, three beeps will sound, and the rotor will brake to rest. Some smaller rotors may not be able to warm the chamber to higher temperature settings.

To select this program, press the Program arrow keys, until a **C** appears in the Program display. Select the desired temperature, install a rotor, and press the **START** key.

3.5 Diagnostic Messages and Error Codes

The beeper sounds in these situations:

- Two times on power up.
- Three times at the end of a spin.
- Five times when a warning occurs

Diagnostics

Diagnostic messages appear in place of the speed display, in the following cases:

Message	Description
bAL	bAL indicates an unbalanced rotor. Open the cover, to erase this message. Verify that a balanced load is installed. Inspect the rotor, and rearrange the tubes, or add additional tubes, with fluid, to balance the rotor.
LId	LId appears if you press the START key, when the cover is not closed. Close the cover, to erase this message.
PFAIL	PFAIL appears if power was interrupted during a run. Press START , to resume the previous run. Press STOP , to erase this message. PFAIL indicates a power failure. This message appears when the unit is turned back on, following the failure. The front panel will alternate between the PFAIL message and the remaining run time, or elapsed time, if in Hold mode.

Error Codes

Error Codes require factory-authorized maintenance. A typical error means that the internal microprocessor has detected impermissible readings, or a failure, elsewhere, in the unit. Error messages appear in the speed display. When an error code is displayed, unplug and reconnect the unit to power. If the error code reappears, tell the service personnel which message appeared, when you report the problem.

Error Message	Description
Err 1	No Tachometer Tachometer signals were not present during the run. The rotor coasts to a stop. Cover opening is inhibited, after this error.
OSPd	Overspeed Speed is 200 RPM above the maximum speed for the installed rotor. The rotor will brake to a stop.
rEFR	Refrigeration Failure (Refrigerated only) The unit displays this code, if the measured temperature exceeds 45°C, at any time during the run.
FSAFE	Fail-safe Time out Independent circuitry, on the circuit board, has sensed a lack of activity, from the control microprocessor. All power circuits (including motor, latch, solenoid, etc.) are disabled.
COPF	Cop Watchdog/OpCode Trap Error The microprocessor has sensed a lack of activity, from the program that controls the centrifuge. The rotor will coast to a stop.
COP	COP Watchdog Not Enabled The microprocessor COP is not enabled. The rotor will coast to a stop.
UndFI	Undefined Interrupt The microprocessor was interrupted by an undefined source. The rotor will coast to a stop.
ILLOP	Op-Code Trap Error The rotor will coast to a stop
dIR	Wrong Direction of Rotation The microprocessor discovered wrong direction of rotation, during acceleration
Warnings during a spin: HEAd, LIId, PFaIL, and dIR error messages can occur during a spin. In this case, the rotor brakes or coasts to a stop, and the run ends.	

4 Applications

4.1 Introduction

This section describes the use of specific rotors and accessories. More detailed information is shipped with the rotor or accessory itself. This section contains five reference sections:

- Speed and Force Tables
 - Derating Table for Dense Samples
 - Chemical Resistance Table
 - Decontamination Table
 - Nomograph
-

Caution: Do **not** exceed maximum rated speed for each rotor/accessory combination. Maximum rated speeds can be found in Section 4.2 - **Speed And Force Tables**.

Relative Centrifugal Force (RCF or G-force) at a given speed varies with the rotor, and with the distance away (rotating radius) from the shaft of the centrifuge (center of rotation). The rotating radius is measured to the furthest **inside** tip of the tube, away from the centrifuge shaft. The Speed and Force Tables indicate the maximum speed and RCF that the Centra-CL3/CL3R can achieve, with various rotor/accessory combinations. The Derating Table specifies reductions in maximum RPM, when spinning samples with specific gravity above 1.2.

Use of any tube above its rated RCF can cause tube cracking. To avoid this, compare the G forces, specified in the Speed and Force Tables, with the ratings for the tubes that you are using. If the tubes are not rated for the force that the centrifuge will apply, look up their reduced G force, and enter it on the control panel.

Corrosive Solvents

Your IEC centrifuge is made of materials designed to resist immediate attack from most laboratory chemicals. Prolonged exposure should be avoided, by immediately removing the chemical from rotor or assembly. Rotors and accessories placed in the chamber are made of a variety of materials, including aluminum and polypropylene. The Chemical Resistance Table shows the suitability of each material with different classes of reagents.

Section 5.2 describes how to clean and remove corrosion from the chamber, rotors, and accessories. Follow these instructions, and clean spills promptly, to minimize the effect of corrosive chemicals and to avoid expensive repairs.

4.2 Speed and Force Tables

4 Place Rotor 243 for Use only with Centra-CL3 and Centra-CL3R					
Carrier	Number of Places	Volume	Maximum RPM	Maximum RCF xg	Radius (cm)
6560E	2	50 ml Falcon/Corning	4000	3200	18
6561E	5	15 ml Falcon/Corning	4000	3200	18
6562E	9	Long (100-125mm) Blood Tubes	4000	3200	18
6563E	9	Short (75-100mm) Blood Tubes	4000	3200	18

Rotor Packages 52151, 52152, 52153, 52154

Rotor 215 4 Place Horizontal Swinging Bucket (Use requires 50968 tapered shaft adapter)						
No. of Places	Tube Volume (ml)	Trunnion/ Shield or Carrier	Max Speed (rpm)	Max RCF (xg)	Max Radius (cm)	O.D. x Length (mm) Common Tube Size
4	50	325/320**	4100	2650	14.0	30 x 116
4	50	350/323**	3800	2050	15.2	Falcon/Corning Conical
4	10	310/356	4300	2750	13.2	17.2 x 113
8	50	326/320	3600	2050	14.2	30 x 116
12	10	355/356	3600	1900	13.2	17.2 x 112
12	10	366/1013	4100	2400	12.8	16.5 x 107 16 x 75; 16 x 100
16	5 - 7	366/1018	4150	2450	12.8	14.2 x 103 13 x 75; 13 x 100
20	3 - 5	366/369	4600	2625	11.1	12.6 x 83 10-12 x 75
4	3	1024	2050	500	10.6	1" x 3" Microscope Slide

** Order adapter 1106 and 571 cushion, to spin 15 ml Falcon/Corning Conical Tubes

Rotor Package 52212

Rotor 221 6 Place Horizontal Swinging Bucket (Use requires 50968 tapered shaft adapter)						
No. of Places	Tube Volume (ml)	Shield	Max Speed (rpm)	Max RCF (xg)	Max Radius (cm)	O.D. x Length (mm)
6	10	356	4400	2800	13.0	17.2 x 102
6	15	303	4000	2600	14.6	17.2 x 119 Falcon Corning Conical Kimble 45168-125

Rotor 244 2-Place (Tray) Horizontal Microplate (Use requires 50968 tapered shaft adapter)						
No. of Places	Tube Volume (ml)	Carrier	Max Speed (rpm)	Max RCF (xg)	Max Radius (cm)	Width x Length (mm)
4	-	included #	4000*	1800	10.0	86 x 128 (96 well) Microplates
2	-	49852	4000*	1800	10.0	86 x 128 x 55mm Deep Plates

* Replacement carrier is IEC No. 49852

** See derating table for 244 rotor

Rotor Package 58012

Rotor 801 6-Place Fixed Angle 45° (Use requires 50968 tapered shaft adapter)						
No. of Places	Tube Volume (ml)	Shield	Max Speed (rpm)	Max RCF (xg)	Max Radius (cm)	O.D. x Length (mm)
6	50	305	4600	2950	12.1	30 x 133 Falcon Corning Conical*
6	50	320	5200	3300	10.8	30 x 116 Corning 8300-50

*With IEC 315 Conical Cushion

Rotor 804S 4-Place Fixed Angle 45° with 323 Sealed Dome Shields (Use requires 50968 tapered shaft adapter)						
No. of Places	Tube Volume (ml)	Shield	Max Speed (rpm)	Max RCF (xg)	Max Radius (cm)	O.D. x Length (mm)
4	50	323*	7200	6675	11.5	Falcon/Corning Conical
4	60	341	2500	1000	14.3	Corning

* Order adapter 1106 and 571 cushion, to spin 15 ml Falcon/Corning tubes

Rotor Package 58092

Rotor 809 12-Place Fixed Angle 45° (Use requires 50968 tapered shaft adapter)						
No. of Places	Tube Volume (ml)	Shield	Max Speed (rpm)	Max RCF (xg)	Max Radius (cm)	O.D. x Length (mm)
12	10	356	5300	3200	10.2	17.2 x 88
12	15	303	4800	2880	11.2	17.2 x 102
12	15	302	4200	2480	12.6	17.2 x 122 Falcon/Corning Conical

Rotor Package 58153

Rotor 815 24 Place Fixed Angle 33° (Use requires 50968 tapered shaft adapter)						
No. of Places	Tube Volume (ml)	Shield	Max Speed (rpm)	Max RCF (xg)	Max Radius (cm)	O.D. x Length (mm)
24	10	356	4800	2860/2340	11.1/9.1	17.2 x 88
24	15	303	4200	2360/1970	12/10	17.2 x 102
24	15	302	3800	2100/1800	13/11	17.2 x 122 Falcon Corning Conical

Rotor Package 58162

Rotor 816 8-Place Fixed Angle 33° (Use requires 50968 tapered shaft adapter)						
No. of Places	Tube Volume (ml)	Shield	Max Speed (rpm)	Max RCF (xg)	Max Radius (cm)	O.D. x Length (mm)
8	50	320	4600	2800	11.7	30 x 115 Corning 8300-50
8	50	305	4300	2650	12.8	30 x 134 Falcon/Corning Conical*

* With IEC 315 cushion, order adapter 1106 and cushion 571 to spin Falcon/Corning tubes

Rotor 818 12-Place Fixed Angle 35° (Use requires 50968 tapered shaft adapter)						
No. of Places	Tube Volume (ml)	Adapter Number	Max Speed (rpm)	Max RCF (xg)	Max Radius (cm)	O.D. x Length (mm)
12	5	-	8500	6060	7.5	12 x 80 IEC 2804, 2840
12	1.5 - 2	5762	8500	4680	5.5	11 x 66
12	B-D/.5	5761	8500	4770/3960	5.9/5.0	8 x 66
12	.4/.25	5760	8500	4680/3630	5.9/5.0	6 x 66

Rotor 819 10-Place Fixed Angle 35° (Use requires 50968 tapered shaft adapter)						
No. of Places	Tube Volume (ml)	Adapter Number	Max Speed (rpm)	Max RCF (xg)	Max Radius (cm)	O.D. x Length (mm)
10	10	-	8500	6060	7.6	16.1 x 85 IEC 2046, 2067, 2801, 2850

Rotor 836 6-Place Fixed Angle 30°

(Use requires 50968 tapered shaft adapter)

No. of Places	Tube Volume (ml)	Adapter Number	Max Speed (rpm)	Max RCF (xg)	Max Radius (cm)	O.D. x Length (mm)
6	30	-	8500	6060	7.5	25.8 x 100 IEC 2047, 2055, 2802
6	15	5965	8500	5820	7.2	16.1 x 109
6	5	5966	8500	5650	7.0	12.1 x 112
6	3	5967	8500	5490	6.8	10.9 x 95

Rotor 841 12-Place Fixed Angle 45°

(Use requires 50968 tapered shaft adapter)

No. of Places	Tube Volume (ml)	Adapter Number	Max Speed (rpm)	Max RCF (xg)	Max Radius (cm)	O.D. x Length (mm)
12	1.5 - 2	-	8500	4680	5.8	11 x 39
12	B-D	5763	8500	4770	5.9	B-D Microtainer Tubes
12	.5	5763	8500	3960	4.9	8 x 66
12	.4	5764	8500	4680	5.8	6 x 46
12	.25	5764	8500	3630	4.5	6 x 46

Microtube Rotors

(Use requires 50036 hub adapter on 50968 tapered shaft adapter)

Rotor Cat. No.	No. of Tubes and Tube Size	Adapter Cat. No	Max Speed (RPM)	Max RCF (xg)	Radius (cm)
891 ¹ (Aerosol Contained)	1.5 ml	-	8500	6740	8.35
	24 x 0.6 ml B/D Microtainers™	5763**		6830	8.45
	24 x 0.5 ml PCR microtubes	5763**		6020	7.45
	24 x 0.4 ml microtubes	5764**		6740	8.35
	24 x 0.25 ml microtubes	5764**		5860	7.25
851 ²	24 x 1.5 ml	-	8500	6740	8.35
	24 x 0.6 ml B/D Microtainers™	5763**		6830	8.45
	24 x 0.5 ml PCR microtubes	5763**		6020	7.45
	24 x 0.4 ml microtubes	5764**		6740	8.35
	24 x 0.25 ml microtubes	5764**		5860	7.25
852 ²	48 x 0.5 ml PCR microtubes	-	8500	6460	8.00†
				6060	7.50‡
	24 x B/D Microtainers™	-		6950	8.60†
853 ²	40 x 0.4 ml microtubes	-	8500	6790	8.40
	40 x 0.25 ml microtubes	-		6060	7.50
	40 x 0.8 ml (6x50 mm) glass	-		6870	8.50

Microtainers® is a registered trademark of Becton Dickinson

** Order 2 pks of adapters separately. IEC 5763 and 5764 are packaged 12/pk.

† Outer row holds 24 tubes

‡ Inner row holds 24 tubes

1 IEC 891 Rotor Provides Aerosol Containment and has been tested for microbiological containment by PHLS-CAMR, Porton Down. Meets requirements of US OSHA Bloodborne Pathogen Final Rule: (Regulation 29 CFR Part 1910.1030. Complete with IEC 50417 Aerosol Containment Cover, IEC 50525 Inner and IEC 36597 Outer rubber O-ring seals.

2 IEC 851, 852, 853 rotors

245 Horizontal Rotor 4x250 ml

(Use requires 50968 tapered shaft adapter)

No. of Tubes x Tube Size	Max Tube Size		Ultrac Adapter	Max RPM	Max RCF xg	Radius (cm)
	O.D. mm	L. mm				
40 x 1.5 ml microtubes	-	-	7228	2750	1375	16.2
40 x 3 ml	10.9	75	7228	2750	1450	17.2
48 x 5 ml	12.1	131	7226	2750	1450	17.2
5-7 ml (13 x 75-100mm vacutainers)	13.3	131	7238	2750	1450	17.2
28 x 10-15 ml vacutainers	16.2	110	7225	2750	1450	17.2
16 x 15 ml Falcon Conical	-	-	7230	2750	1475	17.6
12 x 30 ml	25.5	131	7223	2750	1450	17.2
4 x 50 ml	28.6	131	7231	2750	1450	17.2
4 x 50 ml Falcon/Corning Conical	-	-	7231	2750	1450	17.2
4 x 175 ml (Falcon 2076)	61.0	131	*	2750	1475	17.6
4 x 200 ml (Nunc 376813)	61.0	131	**	2750	1475	17.6
4 x 225 ml (Falcon 2075)	61.0	131	*	2750	1475	17.6
4 x 250 ml (IEC 2502, 2504)	61.0	131	-	2750	1500	17.8

* Also order Falcon 2090 cushions

**Also order IEC 5792 cushions

268 Horizontal Rotor 4x250 ml

(Use requires 50968 tapered shaft adapter)

No. of Tubes x Tube Size	Max Tube Size		Ultrac Adapter	Max RPM	Max RCF xg	Radius (cm)
	O.D. mm	L. mm				
40 x 1.5 ml microtubes	-	-	7228	3425	1800	13.7
40 x 3 ml	10.9	75	7228	3425	1925	14.7
48 x 5 ml	12.1	106	7226	3425	1925	14.7
40 x 7 ml	13.3	106	7236	3425	1925	14.7
28 x 7-10 ml	16.2	106	7225	3425	1925	14.7
12 x 15 ml Falcon Conical	-	-	7234	3425	1976	15.1
12 x 30 ml	25.5	106	7223	3425	1925	14.7
4 x 50 ml	28.6	110	7222	3425	1925	14.7
4 x 50 ml Falcon Conical	-	-	7231	3425	1925	14.7
4 x 75 ml (IEC 2059)	38.1	112	7221	3425	1925	14.7
4 x 175 ml (Falcon 2074)	61.0	125	*	3425	1975	15.1
4 x 250 ml (IEC 2261, 2051)	61.0	125	-	3425	2000	15.3

* Also order Falcon 2090 cushions

958 Horizontal Rotor 6x50 ml

(Use requires 50968 tapered shaft adapter)

No. of Tubes x Tube Size	Max Tube Size		TR. Ring	Carrier or Shield	Max RPM	Max RCF xg	Radius (cm)
	O.D. mm	L. mm					
48 x 5 ml	13.6	92	-	381	2600	1125	15.0
36 x Shell vial	17.7	77	-	379	2900	1300	13.7
36 x 7 ml	17.7	88	-	380	2600	1125	15.0
30 x 5 ml	12.6	98	366	369	3200	1600	14.0
24 x 7 ml	14.2	106	366	1018	2800	1375	15.7
18 x 10 ml	16.5	110	366	1013	2800	1400	15.9
24 x 10 ml	17.2	103	354	356	2400	1025	16.1
18 x 10 ml	17.2	112	355	356	2450	1075	16.1
6 x 15 ml	17.2	119	310	356	2950	1575	16.1
6 x 15 ml	17.2	134	310	303	2700	1475	17.6
12 x 50 ml	30.0	120	326	320	2400	1100	16.9
6 x 50 ml	30.0	124	325	320	2800	1475	16.8
6 x Microscope Slides	1"	3"	-	1025	1800	500	13.5

Hemato-Kit Rotor 930

(Use requires 1116 hublock adapter on 50968 tapered shaft adapter)

The 930 Hemato-Kit can convert the CL3 Series into a micro-hematocrit centrifuge, providing a simple, economical way to perform occasional hematocrits. Blood cells are packed in about ten minutes, at 7800 RPM/6200 xg. Kit includes numbered 24-place rotor for 1.75 x 75 mm capillary tubes, 1505 gasket for tubes, cover, hublock adapter and wrench for installing rotor. An accessory microcapillary tube reader available, to complete the system.

Order Cat. No. 930 Hemato-Kit and Cat. No. 2201 Microcapillary Tube Reader.

4.3 Derating Tables

Dense Samples

The Speed and Force Tables list the maximum speed for each rotor/adaptor combination for the CL3 Series. These speeds are guaranteed, for samples whose specific gravity is not greater than:

- 1.2 for swinging bucket rotors
- 1.5 for fixed angle rotors

For denser samples, the maximum guaranteed speed is reduced (derated) by a factor from the table below:

Derating Factor for:		
Specific Gravity	Swinging Bucket	Fixed Angle
1.2	1.000	1.000
1.3	.960	1.000
1.4	.925	1.000
1.5	.894	1.000
1.6	.866	.967
1.7	.839	.939
1.8	.816	.912
1.9	.794	.888
2.0	.774	.866
2.1	.755	.844
2.2	.738	.825
2.3	.721	.807
2.4	.707	.790
2.5	.692	.774
2.6	.678	.758
2.7	.666	.744
2.8	.654	.731
2.9	.642	.719
3.0	.632	.707

Derating Example: An angle rotor, rated for 10,000 RPM, used with samples with a specific gravity of 1.6, cannot spin faster than 9,670 RPM. ($10,000 \times .967 = 9,670$)

Specific gravities greater than 3.0. This table is based on the formula:

$$\sqrt{(S_o/S_a)}$$

You can use the same formula to compute derating factors for specific gravities greater than 3.0.

- S_o is the maximum specific gravity allowed before derating (1.2 or 1.5, depending on the type of rotor).
- S_a is the actual specific gravity of the sample.

Caution: Do not exceed the rated speed or specific gravity. Higher speeds or specific gravities will impose unnecessary wear on the centrifuge, and can cause **rotor failure**. **Wear and damage caused in this manner are not covered under warranty.**

244 Rotor

The 244 rotor is designed for centrifugation of multi-well microplates. The weight of the loaded microplates must be equally distributed between the rotor's two carriers. The maximum rated speed for the 244 rotor, when each of the carriers is loaded with 280 grams (total load of 560 grams), is 4000 rpm.

Caution: Loads greater than 280 grams (weight of the microplate and sample) must have maximum speed derated (according to the following table), to avoid **rotor failure**.

Derating Table for 244 Rotor	
Load per Carrier (grams)	Max. Speed (rpm)
280	4000
300	3600
320	3300
340	3000
360	2800
380	2600
400	2400
450	1900
500	1400
600	800
Greater than 600	do not use

4.4 Chemical Resistance Table

The CL3 Series is made of materials that are designed to resist attack from most laboratory chemicals. A variety of materials, including aluminum and polypropylene, comprise the rotors and accessories. The Chemical Resistance table shows the suitability of each material, with different classes of reagents.

Note: Chapter 5 describes how to clean and remove corrosion from the chamber, rotors, and accessories. Follow the instructions, and clean spills promptly, to minimize the effect of corrosive chemicals and avoid expensive repairs.

	Plastic										Metal					Other			
	PA	PC	PE	PP	PU	NL	DN	CN	NN	PS	TI	SS	AL	MB	MG	RR	BN	VN	PF
Acids, dilute or weak	E	E	E	E	G	E	F	N	F	E	G	G	F	F	N	F	E	E	E
Acids*, strong or conc.	E	N	E	E	F	N	N	N	N	F	N	N	N	N	N	N	F	G	N
Alcohols, aliphatic	E	G	E	E	F	E	E	E	N	E	E	E	E	E	F	E	E	G	E
Aldehydes	G	F	G	G	G	G	G	G	F	N	E	E	E	E	E	E	N	E	E
Bases	E	N	E	E	N	G	N	G	F	E	E	E	E	E	E	G	G	N	N
Esters	G	N	G	G	N	E	G	G	E	N	E	E	E	E	E	N	N	N	E
Hydrocarbons, aliphatic	G	F	G	G	E	N	E	E	E	N	E	E	E	E	E	N	E	E	E
Hydrocarbons, aromatic	F	N	G	F	N	N	E	E	E	N	E	E	E	E	E	N	N	E	E
Hydrocarbons, halogenated	F	N	F	F	N	N	G	E	G	N	E	E	E	E	N	N	N	F	E
Ketones	G	N	G	G	N	N	E	E	E	N	E	G	G	G	E	N	N	N	E
Oxidizing Agents, strong	F	N	F	F	N	N	N	N	N	N	E	F	N	N	N	N	F	E	E
Salts	E	E	E	E	E	E	E	E	E	E	E	F	F	F	N	E	E	E	E

*For Oxidizing Acids, see "Oxidizing Agents, strong".

PA - POLYALLOMER

PC - POLYCARBONATE

PE - POLYETHYLENE

PP - POLYPROPYLENE

PU - POLYURETHANE

NL - MODIFIED PHENYLENE OXIDE (NORYL)

DN - ACETAL HOMOPOLYMER (DELIN)

CN - ACETAL COPOLYMER (CELCON)

NN - NYLON

PS - POLYSTYRENE

TI - TITANIUM

SS - STAINLESS STEEL

AL - ALUMINUM

MB - MANGANESE BRONZE

MG - MAGNESIUM

RR - RUBBER

BN - BUNA-N

VN - VITON

PF - PHENOLIC FIBER

Classification of Resistance

E= Excellent

G= Good

F= Fair

N= Not Recommended

4.5 Decontamination Table

Compatible Processes For Decontamination																				
Sterilization Methods	Plastic										Metal					Other				
	PA	PC	PE	PP	PU	NL	DN	CN	NN	PS	TI	SS	AL	MB	MG	RR	BN	VN	PF	PT
Mechanical																				
Autoclave*	S	M	U	S	M	U	S	S	S	U	S	S	S	S	S	S	S	M	S	M
Ethlene Oxide Gas	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	U	S	S	S
Dry Head 160°C@2Hrs.	U	U	U	U	U	U	U	U	U	U	S	S	U	S	S	U	U	U	U	U
Chemical																				
Ethanol	S	S	S	S	U	S	S	S	U	M	S	S	S	S	S	S	S	S	S	S
40% Formalin	S	S	S	S	U	S	S	S	S	U	S	S	S	S	S	S	U	S	S	S
Methanol	S	M	S	S	M	S	S	S	U	M	S	S	S	S	S	S	S	U	S	S
2-Propanol	S	S	S	S	M	S	S	S	U	S	S	S	S	S	M	S	S	S	S	S
5% Sodium Hypochlorite**	S	S	S	S	U	S	U	U	U	S	S	M	U	U	U	S	U	S	S	M
3% Hydrogen Peroxide	S	S	S	S	S	S	M	S	U	S	S	S	S	S	U	S	S	S	S	M
100% Hydrogen Peroxide	S	S	S	S	S	U	U	U	U	S	S	S	S	S	S	U	U	S	S	U
5% Phenol Solution	M	U	U	S	U	U	M	M	U	M	M	M	M	M	M	M	U	S	S	U

*For Oxidizing Acids, see "Oxidizing Agents, strong".

PA - POLYALLOMER

PC - POLYCARBONATE

PE - POLYETHYLENE

PP - POLYPROPYLENE

PU - POLYURETHANE

NL - MODIFIED PHENYLENE OXIDE (NORYL)

DN - ACETAL HOMOPOLYMER (DELTRIN)

CN - ACETAL COPOLYMER (CELCON)

NN - NYLON

PS - POLYSTYRENE

TI - TITANIUM

SS - STAINLESS STEEL

AL - ALUMINUM

MB - MANGANESE BRONZE

MG - MAGNESIUM

RR - RUBBER

BN - BUNA-N

VN - VITON

PF - PHENOLIC FIBER

PT - PAINTED SURFACES

*Autoclaving

12°C 20 min. @
2 ATM (15 PSIG)

**Household Bleach

S=SATISFACTORY

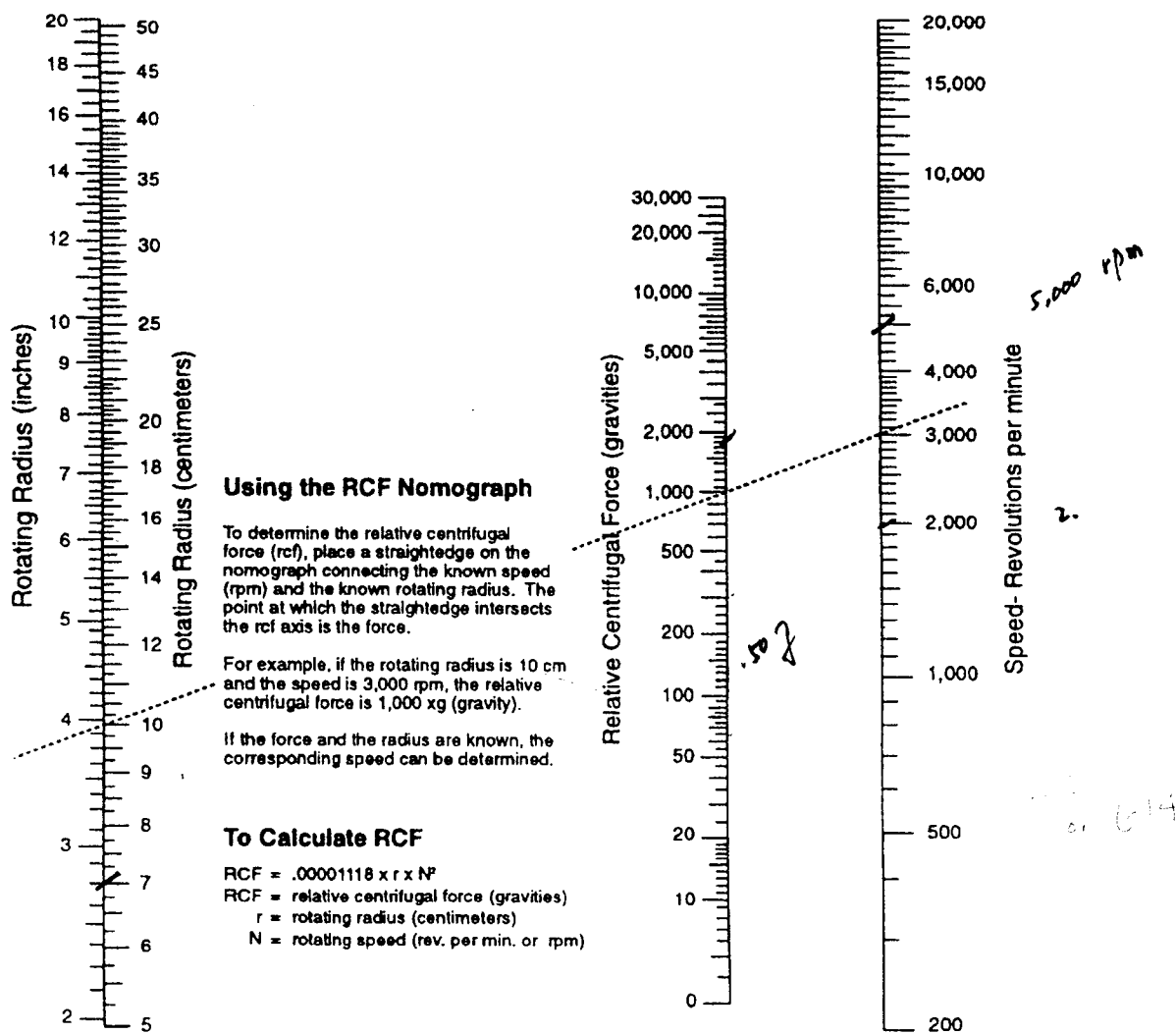
M=MARGINAL

U=UNSATISFACTORY

Warning:

This chart describes the material compatibility of various sterilization methods. It does not specify the adequacy of sterilization. Refer to section 4.4 - **Chemical Resistance Table**, for material compatibility during centrifugation.

4.6 RCF Nomograph



5 Maintenance

5.1 Introduction

This chapter explains how to keep your unit in good operating order. It includes instructions for cleaning, decontaminating, and storing. This chapter, also, covers the cover interlock bypass.

See the end of the chapter, for information on service and warranties.

5.2 Care and Cleaning

Keep your centrifuge clean, to ensure good operation, and to extend its life.

Clean the sample chamber, rotor, and lid, at the end of each work day, and immediately after any spill. To clean the chamber, use a damp sponge, warm water, and a mild liquid detergent, suitable for washing dishes by hand, such as Ivory® liquid. Do not use caustic detergents, or detergents that contain chlorine ions. These attack metals.

Remove stubborn stains with a plastic scrub pad. Do not use steel wool, wire brushes, abrasives, or sandpaper. They create corrosion sites. Never pour water directly into the rotor chamber.

Scrub the rotor's tube cavities with a stiff test tube brush that has end bristles and a non-metallic tip. Dry each part, after cleaning, with a clean, absorbent towel.

If glass breakage occurs, remove all broken pieces immediately. If breakage recurs, replace all adapters and cushions. Particles of broken glass embed in the plastic or rubber accessories. Glass particles can come in contact with new glass tubes, creating pressure points that may result in breakage recurring. Glass particles, in the chamber, grind to a fine gray dust, during centrifugation. This dust can coat the inside of the centrifuge.

Corrosion

IEC manufactures and finishes rotors and structural accessories to give maximum resistance to corrosion. To maximize the life of the unit, continually inspect the rotor cavities for corrosion, especially if you use chloride ion solutions, such as sodium chloride (saline), and sodium hypochlorite (household bleach), because these solutions attack most metals. Clean the rotor, rotor chamber, and accessories (particularly the sample compartments and bucket cups) thoroughly, after each exposure. Inspect all surfaces, under bright light, for corrosion. Be aware that small crevices grow deeper, eventually resulting in system failure.

Replace the shaft, locking nut, rotor, or accessories, if they become corroded, cracked, deformed, or gouged.

If you see any corrosion, remove it immediately, using the following procedure:

1. Follow the cleaning procedure, at the start of this section.
2. Soak the product in mild hand dish washing detergent, and scrub the product thoroughly with a stiff test tube brush. The brush should have end bristles and a non-metallic tip.
3. Soak the product, again, in clear warm water, for a minimum of an hour.
4. Rinse the product in warm water, then in distilled water.
5. Dry the product, thoroughly, with a clean, absorbent cloth.

Caution: If this procedure does not remove the corrosion, discontinue use of the product.

Storage

Store parts on a soft surface, to avoid damage. Rotors and other parts should be clean and dry. Store them open to the air, not in a plastic bag, so that any residual moisture evaporates. Face the parts upward, to avoid moisture retention in the cavities.

Decontamination

If tube breakage occurs, releasing toxic, infectious, pathogenic, or radioactive material into the unit, decontaminate the chamber.

Rotors have sealed containers, that provide aerosol containment and, if used as directed, keep spillage confined. If breakage occurs, it may be sufficient to only decontaminate the sealed carriers.

The Decontamination Table, in Chapter 4, lists the sensitivity of various materials to common sterilization procedures. When using a 1-to-10 dilution of household bleach (sodium hypochlorite), to decontaminate metal rotors or accessories, follow decontamination by the corrosion cleaning procedure (See 5.2), since chloride ions attack most metals.

Always decontaminate for the minimum recommended time. If you observe corrosion, remove it, as described earlier; discontinue use of the method; and use an alternate decontamination procedure.

Polypropylene sealed carriers can be autoclaved. Remove any sample tubes, before autoclaving, unless they are completely full of sample. Remove caps, stoppers, and other tube closures, before autoclaving, to keep the tubes from collapsing under pressure. Autoclave the rotor and accessories at 121 ° C @ 15 psig for 20 minutes. Do not stack polypropylene rotors during this process. After cooling, perform a normal cleaning operation, as described above.

Repeated autoclaving seriously degrades the performance of polycarbonate sealing covers.

5.3 Cover Interlock Bypass

The cover will remain locked, if power fails. If you need to remove samples from the unit, before power is restored, use the cover interlock bypass, after the rotor has come to a stop.

To bypass the cover interlock:

1. Unplug the centrifuge.
2. Locate the hidden plastic plug, underneath the ledge below the IEC CL3 logo.
3. Use a screwdriver to remove the plug.
4. Pull the attached cord, to release the cover interlock.
5. Replace the plug in the hole.

Do not perform this operation routinely. The centrifuge's cover interlock provides operator safety. It allows the cover to be opened promptly, whenever rotation has stopped.

5.4 Condition of Returned Equipment

Contact IEC, or your dealer, and obtain a return goods authorization (RGA), before returning equipment to IEC. The RGA paperwork includes a Certificate of Decontamination for you to sign. It indicates that you have performed the proper steps for decontaminating your unit.

Warning: All returned units must be decontaminated, free of radioactivity, and free of hazardous, infectious, pathogenic, or toxic materials.

IEC refuses all return equipment shipments, until the signed certificate is received.

You must prepay transportation to the service depot.

5.5 Warranty

IEC wants you to be satisfied with the quality of your CL3 Series centrifuge. We warranty your IEC centrifuge for one year, and IEC rotors for seven years. We will repair or replace any of these products that fail, within this period, from the date of its delivery, due to defects in material and workmanship, and we will ship you the repaired product or its replacement at our expense. You must use IEC-approved rotors and accessories, and genuine IEC spare parts. This warranty does not apply to any instrument that has been repaired without authorization or abused.

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. THE FOREGOING STATES 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. IEC WILL IN NO EVENT BE LIABLE FOR ANY SPECIAL OR CONSEQUENTIAL DAMAGES WHATSOEVER AND OUR LIABILITY UNDER NO CIRCUMSTANCES WILL EXCEED THE PURCHASE PRICE FOR THE GOODS FOR WHICH LIABILITY IS CLAIMED.

6 Specifications

Maximum Speed:	8,500 RPM (841 fixed angle rotor) 4,000 RPM (243 swinging bucket rotor)
Maximum Force:	6,200 xg (930 fixed angle rotor) 3,200 xg (243 swinging bucket rotor)
Maximum Number of Tubes:	48 x 5 ml sealed (243 rotor) 12 x 25 ml Universal sealed (243 rotor) 20 x 15 ml Falcon/Corning sealed (243 rotor) 8 x 50 ml Falcon/Corning sealed (243 rotor) 4 x 250 ml (243 rotor) 4 x Microplates/2 x Deep plates (244 rotor)
Maximum Sample Volume:	1 liter (243 rotor)
Operator Controls:	
Chamber Temperature*:	-9° C to 40° C, by 1 C°
Speed:	0 - 8,500 RPM, by 100 RPM
Spin Duration:	0:01 through 0:59, by 1 second 1:00 through 4:45, by 15 seconds 5 through 99 min., by 1 min. Momentary operation mode Hold mode (indefinite duration) At-Start timing mode At-Speed timing mode
Repeatability:	
Temperature*:	± 1 C° in the range from +4° C to +22° C
Rotation:	to 10 RPM
Motor:	Brushless DC
Refrigerant*:	HP-80, CFC-free

Power Requirements

Voltage:

3750 - 120V/60 Hz
3751 - 220-240V/50/60 Hz
3755 - 120V/60 Hz
3756 - 220-240V/50 Hz
3757 - 220-240V/60 Hz

Full specification compliance is guaranteed for up to
 $\pm 5\%$ line voltage specified.

Function guaranteed up to $\pm 10\%$ of line voltage

Operating Current:

3750 - 5.5 AMPS
3751 - 3 AMPS
3755 - 10 AMPS
3756 - 5 AMPS
3757 - 5 AMPS

Heat Output:

(max)

CL3: 1500 BTU/Hr
CL3R: 2700 BTU/Hr

Dimensions (CL3R)

Sample Loading Height: 32 cm (12.5 in)
Cover Closed Height: 37 cm (14.5 in)
Cover Open Height: 84 cm (33 in)
Width: 49 cm (19.5 in)
Depth: 53 cm (21 in)
Weight:
(shipping weight) 68 kg (150 lbs)
(net weight) 46 kg (100 lbs)

Dimensions (CL3)

Sample Loading Height: 32 cm (12.5 in)
Cover Closed Height: 37 cm (14.5 in)
Cover Open Height: 84 cm (33 in)
Width: 49 cm (19.25 in)
Depth: 53 cm (21 in)
Weight:
(shipping weight) 91 kg (200 lbs)
(net weight) 68 kg (150 lbs)

Sound Level: 60 db(A) max.

Specifications Subject To Change Without Notice

* CL3R Only