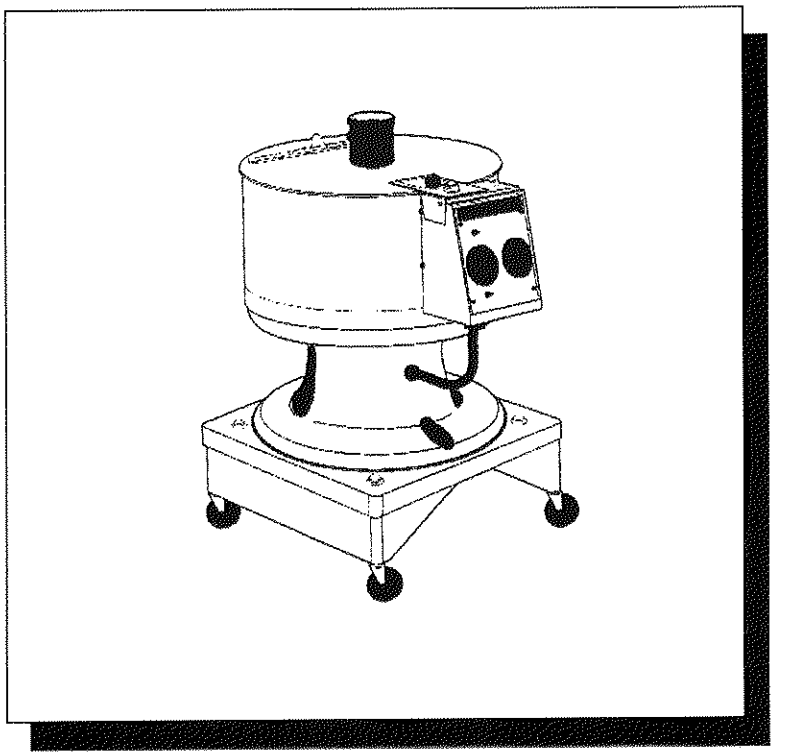
Thermo
ELECTRON CORPORATION

OPERATION MANUAL
OM7165

Revision 4



Model K

Ventilated Centrifuge
Cat. No. 7165 -- 120 VAC, 60 Hz
Cat. No. 7160 -- 240 VAC, 50 Hz

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Table Of Contents

1 INTRODUCTION

The Model K is a large-capacity floor-model centrifuge for general-purpose use in factories, industrial, medical, and scientific laboratories. This floor model unit can achieve centrifugal force of up to 4,275 xg depending upon rotor used.

The centrifuge has an easy-to-use control panel that allows timed and continuous operation and selection of variable speeds. The control panel simplifies operation and ensures repeatable results.

An accessory six-liter rotor/adapter system accommodates virtually any common centrifuge tube or bottle up to 1000 ml. Other swinging bucket and angle rotors may be used for a wide variety of requirements including ASTM tests and specialized methods in food, petroleum and environmental testing. An optional heating jacket is available (Cat. No. 6626-120V/60 Hz or Cat. No. 6627-240V/50 Hz) for sample temperature control from ambient to 80°C. (176°F). For batch-continuous flow separations, either solid or perforated IEC basket rotors with stainless steel draining chamber may be installed in the unit.

A fail-safe cover interlock ensures that the cover is closed before a run can begin, and keeps the cover closed until the rotor has stopped, even if the power fails. (A mechanical bypass permits removal of samples in the event of a power failure.) Rugged all-steel construction provides quiet operation and long-term reliability for this classic workhorse machine.

The Model K design emphasizes simplicity, reliability and rugged construction. Air circulation in the rotor chamber minimizes heat build-up, even during long runs.

2 INSTALLATION

2.1 Receiving the Unit

IEC ships the centrifuge in a carton that protects it from shipping hazards. Follow the unpacking instructions on the carton. Locate the Model K Pre-installation Instructions and read them. These instructions describe what inspections you should make before signing for the delivery, and how to report apparent damage in transit. Be sure to complete the postage-paid warranty card and return it to IEC.

The carton and wooden skid are conveniently moved from the receiving dock to the laboratory by forklift, roller lift, or hand truck.

To open the carton, cut the carton along the bottom edges of all sides. Lift the carton up and off.

2.2 Site Preparation

Move the unit into a position such that the control panel is accessible and the cover can be fully opened. The Specifications (see Section 7) give the dimensions of the unit. Clear space of 30.0 cm (12 inches) around the centrifuge is required.

For quiet and safe operation, the site must be level and must be able to support the unit, which weighs 360 pounds (163 kg), without floor deflection. Select a site that is close to an easily accessible power outlet. The power requirements are discussed in more detail in Section 2.3 Power Configuration. To minimize power fluctuations, the centrifuge should be the only device plugged into its circuit. Select a site such that the 6 foot (1.9 meter) power cord can reach the outlet.

Clearance Envelope

International Electrotechnical Commission standard 1010 part 2-20 limits the permitted movement of a laboratory centrifuge to 300mm in the event of a disruption. The user should therefore mark the clearance envelope boundary around the centrifuge, or laboratory management procedures should require that no person or any hazardous materials are within such a boundary while the centrifuge is operating.

Four metal shipping brackets hold the base of the unit to the wooden skid. Unscrew the nuts (labeled A in Figure 1) holding the steel brackets (B) in place between the base casting and the wooden platform. Unscrewing the nuts releases the brackets. Do not disturb the four bolts (labeled C) that are visible from the top of the centrifuge. These are permanent bolts that hold the vibration dampers in position.

Due to the unit's weight, a hoist is helpful to move the unit into position. If a hoist is not available, carefully break down the wooden cross braces and spacing blocks at the bottom of the carton base. It will take several people to move the centrifuge into position.

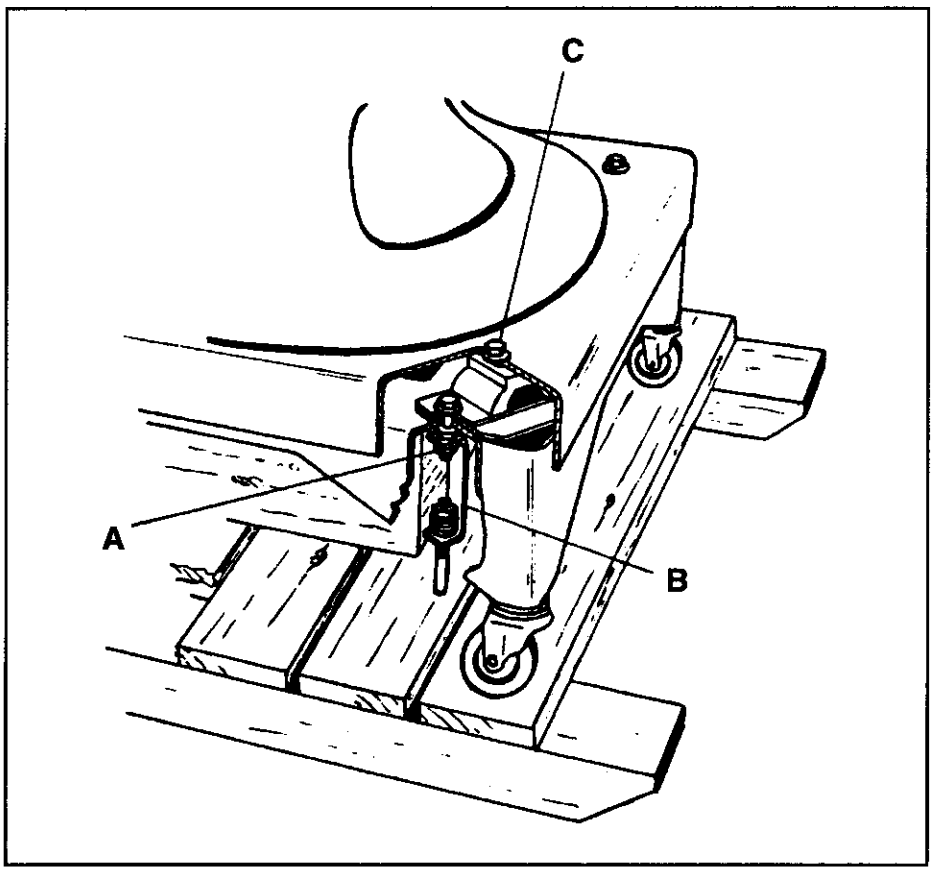


Figure 1 Model K Unpacking

Leveling*

Move the centrifuge to its final position, and using an open-end wrench, loosen the hex nuts, and lower the leveling feet to disengage the two front casters. Install a rotor (see Section 3.2) and use a level placed on the rotor to level the centrifuge. Check that the centrifuge is resting firmly on the leveling feet and two rear casters by alternately pressing down on the back corners. If there is movement, adjust the appropriate leveling foot. Use an open-end wrench to tighten the hex nuts against the base frame to lock the leveling feet in position.

***Not available on all units yet.**

2.3 Power Configuration

You must supply grounded, single-phase AC power at a suitable voltage. The nameplate, located on the front of the guard bowl, indicates the centrifuge's power requirements. If the nameplate reads 120V, the acceptable voltage range is 108-132 VAC. If the nameplate reads 240V, the acceptable voltage range is 216-264 VAC. Use an AC voltmeter to measure voltage at the AC outlet the centrifuge will use. If the voltage is outside the applicable range listed above, use an external transformer before proceeding.
Applying incorrect voltage to the unit may damage the instrument and will void your warranty.

Power Cord

120V units are shipped with a power cord (Part No. 50080). 240V units are shipped with a power line (Part No. 50081) but no plug. The service technician or a qualified electrician attaches this cord to the centrifuge and installs the appropriate national plug. **To avoid the risk of electric shock, do not remove the grounding plug from the power cord, install a plug without a power cord, or use an adapter that fails to complete the power ground circuit.**

2.4 Speed Control Knob Set Up

Before plugging the unit into AC power, calibrate the SPEED CONTROL knob. Slowly rotate the knob clockwise and listen for a click. The click should occur when the knob is at the 0% position. If the click occurs at some other position, loosen the knob with a flat-blade screwdriver and reposition it to the 0% position.

Return the knob to the 0% position. Be sure the timer switch is in the center (OFF) position.

2.5 Timer Set Up

The faceplate on the timer knob is reversible. The markings on one side are calibrated correctly for a 60 Hz power source, the markings on the other side are calibrated correctly for 50 Hz.

If you are using the unit with 50 Hz power, (120 V or 240 V), you must reverse the timer faceplate to obtain correct settings for timed operation. Loosen the timer knob's two set screws with a flat blade screwdriver and remove it from the timer shaft. Remove the faceplate by unscrewing the three Phillips screws. Reverse the faceplate so that the proper text is visible. Verify that the text on the side that will face outward is marked 50 Hz or 60 Hz depending on the power supply you are using.

Refasten the faceplate with the three Phillips screws so that the 0 mark points straight up. Fit the knob onto the timer shaft so that the two set screws are equidistant from the 0 mark. As you tighten the set screws, the knob becomes precisely aligned to the keyways on the timer shaft.

2.6 Opening The Cover

Plug the unit into the AC power outlet whose voltage you have measured. **Do not use an extension cord to connect the unit to AC power.**

The Model K includes a safety cover lock that prevents the cover from opening except when power is applied and the rotor is not rotating.

To open the cover, set the speed control to 0, then push the button on the top of the control panel. The unit unlocks the cover for 5 seconds. You can hear the locking pin retract. During this interval, turn the lever 90° clockwise. The cover can now be opened. If you do not turn the lever in the 5 second interval, press the request button again.

2.7 Tachometer Installation

Open the cover as described above and remove the accessory box shipped inside the rotor chamber. Locate the two-piece bakelite tachometer inside the accessory box. Remove the thumbscrews from each side of the tachometer and separate the inner casing from the outer casing.

Place the inner casing on the top side of the centrifuge cover, lining it up with the three tapped holes in the centrifuge cover. Secure the casing to the cover using the three Phillips screws supplied.

Fit the outer casing over the inner casing so that the tachometer stem and rubber tip go through the center hole in the centrifuge cover. Orient the outer casing so that the gauge can be read from the front of the centrifuge. Allow the springs to raise the outer casing to its highest elevation. Gently tighten the thumbscrews on each side. See Section 4 for operating instructions.

2.8 First Run

Close the centrifuge cover. Latch the cover by turning the lever 90° counterclockwise. Review the use of the control panel, as described in Section 4. Confirm that the speed knob is set at zero. Dial 5 minutes on the timer knob. Switch the timer switch to the ON WITH TIMER position. Slowly dial the SPEED CONTROL up to the 40% setting. In 10 seconds, you should hear the rotor start to spin. During the 5 minute cycle, loosen the thumbscrews on each side of the tachometer. Gently press down the tachometer until the rubber tip engages with the countersunk rotor shaft. The gauge begins to display the rotor speed. Tighten the thumbscrews to secure the tachometer in this position.

Disengaging the tachometer extends the life of the rubber tip. Loosen the thumbscrews and allow the springs to raise the outer casting to its highest elevation. Tighten the thumbscrews.

At the end of the 5 minute cycle, the motor will switch off and the rotor will coast to a stop.

3 ROTOR AND ACCESSORIES

A balanced load is essential with all centrifuges. An unbalanced load produces vibration and can damage the unit. Always ensure that the rotor is loaded symmetrically with a full compliment of accessories and a full (or paired) set of tubes. Tube adapters should also be installed symmetrically.

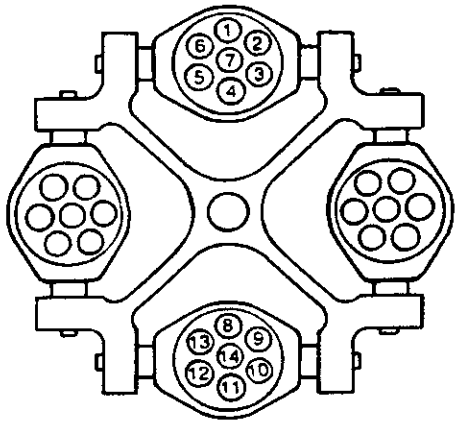
IEC rotors are dynamically balanced at the factory. IEC matches removable parts (trunnion rings, shields, cups and carriers) to within 1.0 gram and stamps the weight on each piece. Check these markings whenever you interchange parts, to ensure that opposite parts are matched weight. Ensure that the total weight of samples and removable parts loaded in opposing positions are equal in weight to within 1.0 gram. The position numbers, present on many rotors and adapters, identify opposing tube positions.

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

3.1 Swinging Bucket Rotors

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 in the mirror image). In addition, for the 227 rotor each swinging bucket or tray must also be symmetric around the axis. Verify this by ensuring that each bucket is loaded so that it does not tilt 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.

Example: Load rotor as follows



No. Of Tubes	Positions
4	3 6 10 13
4	2 5 9 12
4	1 4 8 11
6	6 7 3 13 14 10
6	5 7 2 12 14 9
6	1 7 4 8 14 11
Odd Number	Not Recommended (unless dummy tube used for balance)

Samples of different specific gravities can be processed in the same run, provided that the samples of a given type are balanced around the rotor as though they were the only ones in the rotor.

3.2 Rotor Installation

To install a rotor, grip it on the circumference and lower it straight onto the shaft. Due to its size, the easiest way to grip the 219 rotor is by the bucket arms. Do not grip the windshield.

A hex locking nut (Part No. 1702N) is shipped with the centrifuge. (The 219 windshielded rotor is shipped with its own locking nut.) Use the socket wrench (Part No.1787) shipped with the centrifuge to tighten the appropriate locking nut, holding the rotor in place. The 219 rotor requires use of a shaft adapter (Part No. 3219).

3.3 Rotor Removal

To remove a rotor, remove the locking nut and lift the rotor out of the chamber.

The 219 windshielded rotor has a cover that **must be used at all times when centrifuging.** The 219 cover is attached to the rotor by a locking nut (separate from the nut that holds the rotor on the shaft). The 219 rotor can be removed from the centrifuge without breaking the cover seal.

0-rings are used on rotors with domed cups. The 0-ring seals the interior of the cup. Whenever you clean the cups and domes, inspect the 0-ring. Replace it if it is nicked or cut. When you install a new O-ring be sure it does not roll or twist. Keep 0-rings lubricated with high-vacuum silicon grease (IEC Part No. 2084).

4 CONTROL PANEL OPERATION

4.1 Overview

The knobs and switches on the control panel allow you control of the following variables for a centrifuge run: rotor speed, in RPM; run duration, in minutes; and application of braking. Changing the settings during a run or continuous drive hold immediately affects the run in progress.

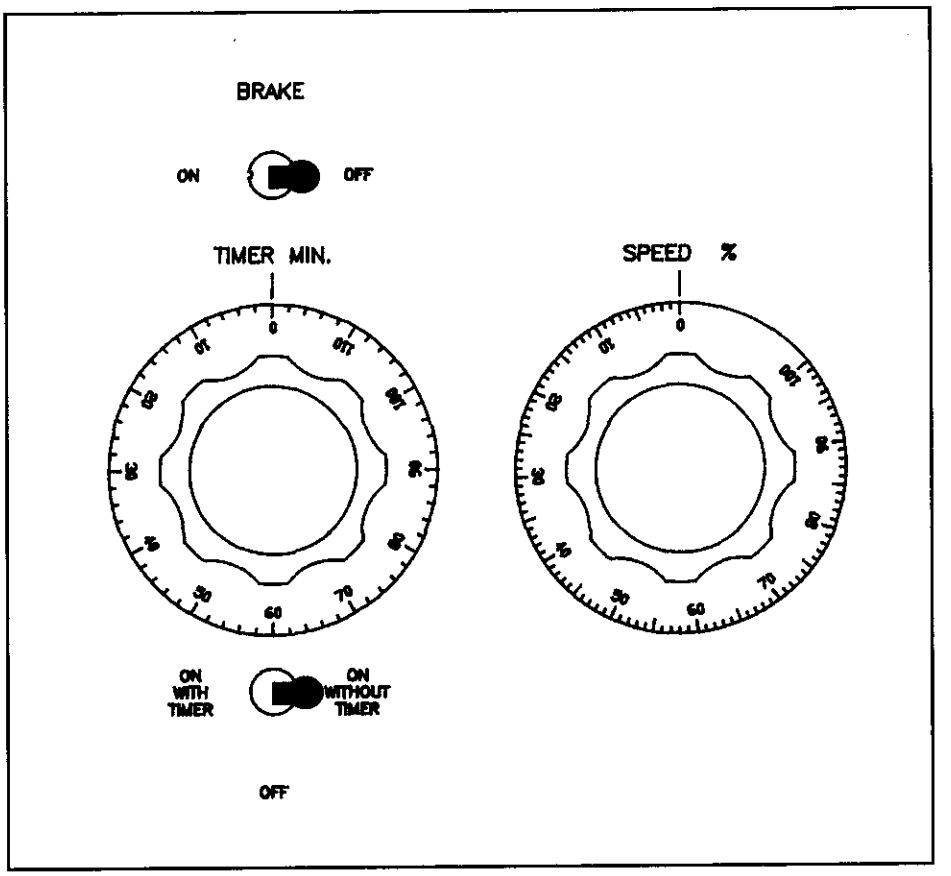


Figure 2 **Model K Control Panel**

4.2 Speed Control

The speed control knob has markings from 0% to 100%. The continuously-variable speed controller regulates the voltage applied to the drive motor.

When using the same rotor and equivalent loads, and assuming the supply voltage is stable, setting the speed control knob to the same position will produce the same rotor speed and centrifugal force from run to run, producing repeatable results. However, the markings on the speed control knob are not actual rotor speeds. To measure rotor speed, use the tachometer (see Section 4.4).

The centrifuge will not start unless the speed control knob was first at the zero position.

All changes to the speed control knob should be made slowly. Rapidly raising the speed control can disrupt the samples and the trunnion-type swinging-bucket rotor.

Safe speeds are limited by your choice of rotor and accessories. Consult the Speed And Force Table in this manual, and the literature accompanying the rotor you are using. When using a new rotor, engage the tachometer (see Section 4.4) and refer to actual tachometer readings, whenever you increase the speed control, to ensure that the operating speed is within the equipment's limits.

Return the speed control knob to 0% at the end of every run.

If the centrifuge loses power for any reason during a run, the motor will not operate until you reset the speed control knob to 0%. This protects the motor.

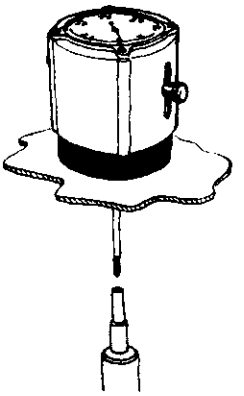
4.3 Timer Controls

The three-position timer switch controls the operating mode of the centrifuge:

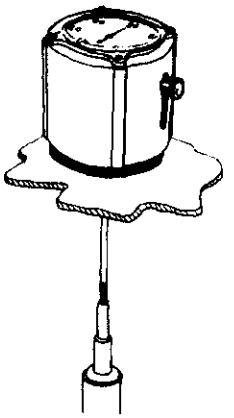
- The center position (OFF) disables power to the unit.
- The right position (ON WITHOUT TIMER) is for manual runs. The run continues until the user moves the timer switch to the center position (OFF). The timer knob is not used in manual runs.
- The left position (ON WITH TIMER) is for timed runs. The user sets the desired time with the timer knob before moving the timer switch to the left position. At the end of the interval dialed by the timer knob, the run ends without further user action.

The timer knob counts down to 0 during a timed run. The setting of the timer knob indicates the amount of time remaining in a run. Turning the knob clockwise during a timed run serves to extend the time of the run. Turning the knob counterclockwise shortens the run time; turning the knob back to 0 is one way to end a timed run. The timer knob must be reset to the desired run time before the next timed run can start.

4.4 Tachometer



Raised



Lowered

The tachometer, mounted on the cover, indicates motor speeds from 0 to 6,000 RPM. Normally, in the raised position, the tachometer is inactive and reads 0 RPM. In the lowered position, a rubber tip at the end of the tachometer shaft contacts the motor drive shaft. Returning the tachometer to the raised position after each use prolongs the life of this rubber tip.

To obtain a brief reading of motor speed, loosen the thumbscrew on each side of the tachometer. Gently press the outer tachometer casing down until the needle begins to give a reading. Allow 10 seconds for the reading to stabilize. Note the reading. Release the outer tachometer casing, allowing it to rise to its highest elevation. Gently tighten the thumbscrews to secure the tachometer in the raised position.

To obtain a continuous reading of motor speed - for example, when adjusting the speed control knob - depress the outer tachometer casing as before, but gently tighten the thumbscrews to hold the tachometer in the lowered position. Refer to the actual tachometer speed after each adjustment made to the speed control knob. After achieving the desired rotor speed, loosen the thumbscrews, allow the outer tachometer casing to rise, and gently tighten the thumbscrews to secure the tachometer in the raised position.

Always secure the tachometer in the raised position before opening or closing the centrifuge cover.

4.5 Brake Switch

The brake switch is a momentary-contact switch. Holding the switch in the left position actuates an electric brake. Braking the rotor to a stop is about twice as fast as letting it coast to a stop. Never use the brake switch while a run is in progress. Instead, first move the timer switch to the center (OFF) position and the speed control knob to zero.

4.6 Cover Unlock

The cover unlock request button is the metal cylinder on the top of the control panel. Pressing this button requests that the centrifuge unlock the cover. If power is applied to the unit, if the speed control is set at 0, and if the rotor speed is below 20 RPM, the unit unlocks the cover for 5 seconds. Otherwise, the button is inoperative.

During the interval that the cover is unlocked, you can open the cover by turning the knob clockwise 90°, so that it points to the left, and raising the cover.

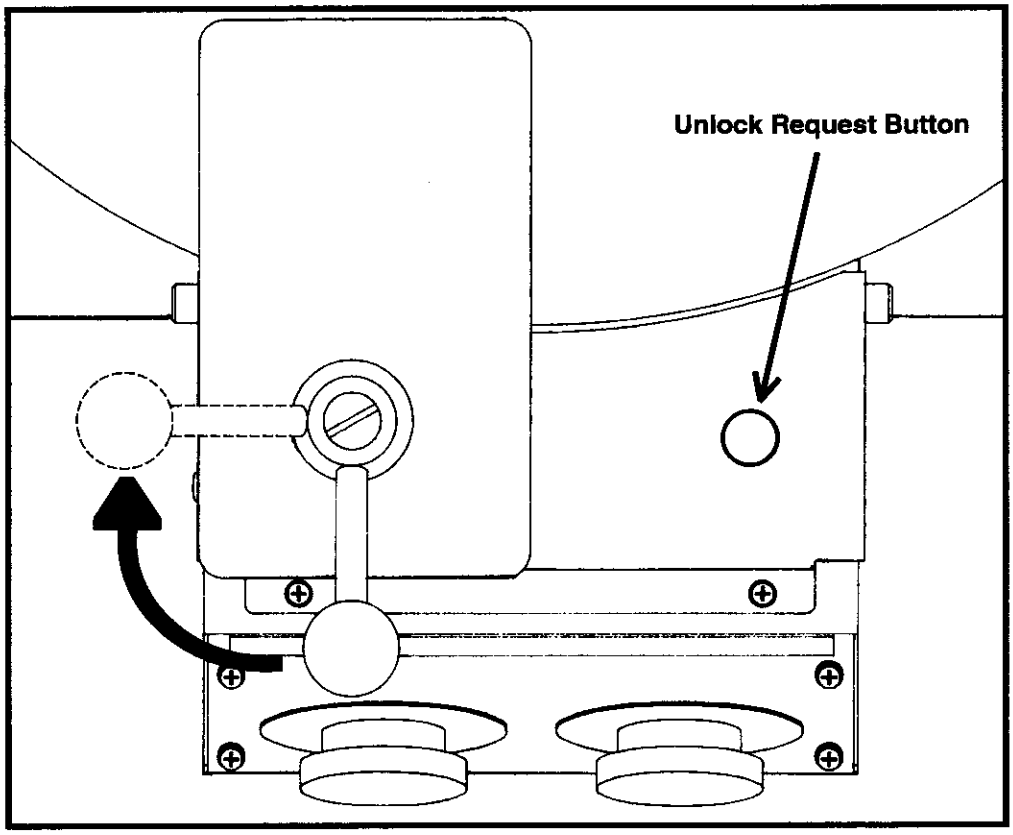


Figure 3 Opening The Cover

4.7 Start Procedure

1. Install and load a rotor (see Section 3). Ensure that the tachometer is raised (disabled). Close and latch the cover. Ensure that the speed control knob is on 0%.

2. For a timed run, dial the desired run time into the timer knob, and move the timer switch to the left position (ON WITH TIMER).

   For a manual run, move the timer switch to the right position (ON WITHOUT TIMER).

3. Set the speed control knob to 40%. If this is the first run for a new rotor, load, or procedure, secure the tachometer in the lowered (operating) position and wait for the reading to stabilize. Consult the tachometer every time you increase the speed by 5% to ensure that you do not exceed the safe operating speed for the rotor an accessories in use.

4. Slowly dial the speed control knob up to the desired speed. If using the tachometer, record the speed control knob setting that produced the desired speed, and disable the tachometer.

Note: At the beginning of a run, the speed control knob must be turned far enough to allow the rotor to start spinning within 10 seconds. Otherwise the centrifuge will lock out. (See 4.9)

4.8 Stop Procedure

1. For a timed run, the run stops automatically when the timer knob returns to 0. To abort a timed run, move the timer switch to the center position (OFF).

   For a manual run, the run continues until you move the speed control to the 0 position (OFF).

2. For more prompt deceleration of the rotor, hold the brake switch in the left position until the rotor stops spinning.

3. Ensure that the tachometer is disabled and secured in its upper position.

4. Set the speed control at 0, press the button at the top of the control panel to request that the cover be unlocked.

5. During the next 5 seconds, turn the cover lever 90° to the left. Open the cover and remove the samples.

4.9 Speed Sensor Fail-Safe/Lockout Feature

The centrifuge has a speed sensor which monitors whether the rotor is rotating or not. It is normally used to allow the cover to be opened only when the motor is stopped. However, in the event of failure of the speed sensor circuit, the centrifuge is designed to stop the motor and prevent the cover from opening.

Because of the above feature, at the beginning of a run the rotor must start spinning within 10 seconds after the speed control is activated. Otherwise, the centrifuge will be locked out and must be reset by pressing the WITH/ WITHOUT TIMER switch to the OFF position momentarily.

5 APPLICATIONS

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

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

Relative Centrifugal Force (RCF or G-force) at a given speed varies with the rotor, and with the length of the sample tube, because the distance of the tube's tip from the center of rotation is different. The Speed and Force Table indicates the maximum speed and RCF the centrifuge can achieve with various rotor/adapter combinations. The Derating Table specifies reductions in rpm when spinning samples with specific gravity above 1.2.

Misapplication of any tube can cause tube rupture. To avoid this, compare the G-forces specified in the Speed and Force Table with the ratings for the tubes you are using. If the tubes are not rated for the force the centrifuge will apply, reduce the speed to limit the G-forces to the rating of your tubes.

5.1 Corrosive Solvents

Your IEC centrifuge is made of materials designed to resist attack from most laboratory chemicals. The surface of the interior of the rotor chamber is enamel-based paint. Rotors and accessories placed in the chamber are made of a variety of materials, including aluminum. The Chemical Resistance Table shows the suitability of each material with different classes of reagents.

Section 6.1 describes how to clean and remove corrosion from the chamber, rotors, and accessories. Follow these instructions, and clean spills promptly to minimize the effects of corrosive chemicals before any resulting chemical attack requires more expensive repair. Replace the shaft, metal locking nut, rotors, or accessories if they become cracked, deformed, or gouged.

LINEAR RACK ROTOR CAT.NO. 227 Maximum Speed 2250 RPM						
Manufacturer's Rack and Cat. No.	**IEC TRAY Cat. No.**	**Adapter Cat. No.**	**Tubes per Rack/Rack per Rotor**	**Max. No. of Tubes**	**G-Force (xg)**	**Radius Max/Min (cm)**
Micromedics 28659 (Black)	47474	-	20/12	240	1180/880	20.8/15.5
Micromedics 24908 (creme) 24996 (blue)	47474	-	14/12	168	1180/880	20.8/15.5
Tracor 000-003604 000-003605 000-003606	47818	Tracor 000-003615	36/4	144	1210/920	21.3/16.3
Tracor 000-003601 000-003602 000-003603	47818	Tracor 000-003615	24/6	144	1210/920	21.3/16.3
LKB 1270-132	47816	-	10/16	160	1210/930	16.4
Packard 240 7600860	46293	-	12/8	96	1080/930	21.4/16.5
Packard 408 5069955996	46293	Packard 5069595	12/12	144	1210/930	21.4/16.5
Packard 504 506009595	46293	Packard 5069595	12/12	144	1210/930	21.4/16.5
Roche 85574	47308& 47474	-	16/4	144	1500/930	20.3/16.4
Technicion SMAC 178-B457	237 and 47474	-	8/6	48	980/830	17.3/14.6

ROTOR 250 16-Place Horizontal Swinging-Bucket						
No. of places	tube volume (ml)	Trunnion /Shield or carrier	speed (max) (rpm)	RCF (max) (xg)	Radius cm (max)	O.D.xLength (mm)
128	1.5-5	2760	2200*	1300	23.8	11.0x120
128	3-5	381	2200	1300	23.9	13.6x108
96	8-12	379	2300	1350	22.6	17.7x91
96	8-15	380	2200	1300	23.9	17.7x102
80	3-5	366/369	2600	1725	22.9	12.6x97
64	7-10	366/1018	2350	1525	24.5	14.2x114
48	10-16	366/1013	2275	1450	24.9	16.5x118
64	10-13	354/356	2150	1275	24.9	17.2x150
64	12-19	354/303	2050	1250	26.5	17.2x163
48	10-13	355/356	2200	1350	24.9	17.2x150
48	12-19	355/303	2100	1300	26.5	17.2x173
16	10-13	310/356	2500	1750	24.9	17.2x154
16	12-19	310/303	2400	1700	26.5	17.2x170
32	40-52	326/320	2150	1350	25.9	30.0x140
16	40-52	325/320	2400	1650	25.7	30.0x146
16	40-52	325/305	2250	1575	27.7	30.0x170
16	50	350/323	2200	1400	25.8	Corning/Falcon
16	40-52	350/1124	2200	1450	26.6	29.4X133
16	75	366/365	2300	1575	26.6	38.0X125
48	-------	1024	1400*	500	22.4	Microscope Slide

ROTOR 253 (279) 12-Place Horizontal Swinging-Bucket						
No. of places	tube volume (ml)	Trunnion /Shield or carrier	speed (max) (rpm)	RCF (max) (xg)	Radius cm (max)	O.D.xLength (mm)
96	1.5-5	2760	2600*	1550	20.4	11.0x115
96	3-5	381	2550	1500	20.5	13.6x107
72	8-12	379	2650	1500	19.2	17.7x82
72	8-15	380	2550	1500	20.5	17.7x99
72	10-19	398	2300	1325	22.3	17.7x119
60	3-5	366/369	3050	2025	19.5	12.6x102
48	7-10	366/1018	2750	1775	21.1	14.2x117
36	10-16	366/1013	2600	1625	21.5	16.5x121
48	10-13	354/356	2500	1500	21.6	17.2x125
48	12-19	354/303	2350	1425	23.2	17.2x138
48	15-19	354/302	2200	1350	25.1	17.2x157
36	10-13	355/356	2550	1575	21.6	17.2x131
36	12-19	355/303	2400	1500	23.2	17.2x146
36	15-19	355/302	2200	1350	25.1	17.2x163
12	10-13	310/356	2900	2025	21.6	17.2x138
12	12-19	310/303	2750	1975	23.2	17.2x154
12	20-25	310/302	2550	1825	25.1	17.2x170
24	40-52	326/320	2500	1575	22.6	30.0x136
24	40-52	326/305	2300	1450	24.6	30.0x158
12	40-52	325/320	2800	1975	22.4	30.0x140
12	40-52	325/305	2550	1775	24.4	30.0x155
12	50	350/323	2700	1825	22.5	Corning/Falcon
12	40-52	350/1124	2600	1750	23.3	29.4x133
12	60-100	350/341	2350	1675	27.1	33.2x177

ROTOR 269 (240) 8-Place Horizontal Swinging-Bucket						
No. of places	tube volume (ml)	Trunnion / Shield or carrier	speed (max) (rpm)	RCF (max) (xg)	Radius cm (max)	O.D.xLength (mm)
64	1.5-5.0	2760	3000*	1800	17.8	11.0x115
64	3-5	381	3000	1800	17.9	13.6x106
48	8-12	379	3200	1900	16.6	17.7x92
48	8-15	380	3000	1800	17.9	17.7x105
48	10-19	398	2650	1550	19.7	17.7x122
40	3-5	366/369	3500	2325	16.9	12.6x102
32	7-10	366/1018	3300	2250	18.5	14.2x122
24	10-16	366/1013	3150	2100	18.9	16.5x126
32	10-13	354/356	2800	1650	18.9	17.2x119
32	12-19	354/303	2650	1600	20.5	17.2x134
32	15-19	354/302	2450	1500	22.4	17.2x153
32	20-25	354/306	2150	1350	26.2	17.2x190
24	10-13	355/356	300	1900	18.9	17.2x126
24	12-19	355/303	2800	1800	20.5	17.2x144
24	15-19	355/302	2550	1625	22.4	17.2x161
24	20-25	355/306	2150	1350	26.2	17.2x192
8	10-13	310/356	3400	2450	18.9	17.2x130
8	12-19	310/303	3200	2350	20.5	17.2x146
8	15-19	310/302	2900	2100	22.4	17.2x165
8	20-25	310/306	2600	1975	26.2	17.2x198
16	40-52	326/320	2850	1800	19.9	30.0x136
16	40-52	326/305	2600	1650	21.9	30.0x153
8	40-52	325/320	3300	2375	19.7	30.0x136
8	40-52	325/305	3050	2250	21.7	30.0x155
8	50	350/323	3050	2050	19.8	Corning/Falcon

OIL TEST ROTOR 287 4-Place Horizontal Swinging-Bucket						
No. of Places	**tube volume (ml)**	**Trunnion/ Shield or carrier**	**speed (max) (rpm)**	**RCF (max) (xg)**	**Radius cm (max)**	**O.D.xLength (mm) or Special Tube**
4	100	392	1200*	290	18.1	Separatory Funnel Kimax 45210
4	100	395	2000*	880	19.8	Pearshape Corning 8200-100 8220-100 Kimax 45244-100
4	100	1022/1120	2450*	1375	20.4	Short Form Conical Corning 88190-100 Kimax 45243-100
20	3-5	364/369	4100	2500	13.3	12.6x97
16	7-10	364/1018	3950	2600	14.9	14.2x114
12	10-16	364/1013	3775	2450	15.3	16.5x117
4	75	364/365	3800	2750	17.1	38.0x126
4	50	364/367A+	2400*	1350	21.2	38.0x168
4	100	364/367	2900*	2250	24.0	38.0x195
*** Speed Limited +Order 575 Cusion for 50mL Oil Lube**						

811A 20-Place ANGLE ROTOR 45°						
No. of places	**tube volume (ml)**	**Shield**	**speed (max) (rpm)**	**RCF (xg) (max) outer/inner row**	**Radius cm (max) outer/inner row**	**O.D.x Length (mm)**
20	10-12	356	5200	3450/2875	11.4/9.5	17.2x99
20	10-13	303	5200	3800/3225	12.6/10.7	17.2x114
20	15-19	302	5000	3875/3350	13.9/12.0	17.2x129
20	20	306	3600	2425/2150	16.7/14.8	17.2x172

822A 12-Place ANGLE ROTOR 45°						
No. of places	**tube volume (ml)**	**Shield**	**speed (max) (rpm)**	**RCF (xg) (max)**	**Radius cm (max)**	**O.D.xLength**
12	40-52	305	3900	2650	15.6	30.0x138
12	40-52	320	4600	3350	14.2	30.0x117

825A 8-Place ANGLE ROTOR 45° (or 825S with 323 shields)						
No. of places	**tube volume (ml)**	**Shield**	**speed (max) (rpm)**	**RCF (xg) (max) outer/inner row**	**Radius cm (max)**	**O.D.xLength**
8	50	323	4300	3000	14.4	29.5x120
8	40-50	1124	4000	2700	15.2	29.5x133
8	60	341	3400	2300	17.9	33.2x185
8	100	340	3200	2125	18.6	33.2x204

831A 36-Place ANGLE RO TOR 45°						
No. of places	**tube volume (ml)**	**Shield**	**speed (max) (rpm)**	**RCF (xg) (max) outer/inner row**	**Radius cm (max) outer/inner row**	**O.D.xLength (mm)**
36	10-12	356	4200	2950/2575	14.9/13.0	17.2x102
36	10-13	303	4400	3475/3050	16.0/14.1	17.2x122
36	15-19	302	3600	2500/2225	17.3/15.4	17.2x140
36	20	306	2950	1950/1775	20.1/18.2	17.2x174

Basket Rotors - Simple Continuous-Flow System							
Rotor	**Type**	**Size**	**speed (max) (rpm)**	**RCF (xg) (max)**	**Radius cm max/min**	**Rotor Chamber Height**	**Cake Capacity mL**
1357	Perf.	11 in	3500	1925	14.0/9.7	9.7	3328
1357A	Solid	11 in	3500	1925	14.0/9.7	9.7	3328
***Speed Limited. Do not exceed speed noted.**							

832A 14-Place ANGLE ROTOR 45°						
No. of places	**tube volume (ml)**	**Shield**	**speed (max) (rpm)**	**RCF (xg) (max)**	**Radius cm (max)**	**O.D.xLength**
14	60	341	2500	2525	18.4	33.2x146
14	100	340	3100	2125	19.8	33.2x165

838A 60-Place ANGLE ROTOR 45°						
No. of Places	**tube volume**	**Shield**	**Speed (max) (rpm)**	**RCF (xg) (max) outer/inner row**	**Radius cm (max) outer/inner row**	**O.D.xLength (mm)**
60	10-12	356	4100	3450/3100	18.4/16.5	17.2 x 114
60	10-13	303	3250	2325/2100	19.6/17.7	17.2 x 126
60	10-19	302	2850	1900/1725	20.7/19.0	17.2 x 138
60	20	306	2500	1650/1525	23.6/21.7	17.2 x 185

845A 8-Place ANGLE ROTOR 45°						
No. of places	**tube volume (ml)**	**Adapter**	**speed (max) (rpm)**	**RCF (xg) (max)**	**Radius cm (max)**	**Bottle**
8	240	-	4600	4275	18.1	IEC 2944
8	100	670	4600	4000	16.9	Corning 8460

ULTRAC ROTOR SYSTEMS 850S ANGLE 45° AND 284 and 259 Swinging-Bucket					
SAMPLE CONTAINER	MAX. DIA (mm)	ULTRAC ADAPTER CAT. NO.	NUMBER OF TUBES		
			850 S ROTOR 6300 rpm 8300 xg RAD+18.3 cm	284 (277) ROTOR 33050 rpm 215 xg RAD=19.7 cm	259 (266) ROTOR 3500 rpm 3300 xg RAD+24.1 cm
1.5-3.5 ml Microtubes/10x75mm)	11.0	7228	60	40	60
5.0ml (12x75mm)	12.2	7226	72	48	72
7-10ml (13x100mm)	13.3	7236	60	40	60
7-12ml (16x75mm)	16.2	7225	42	28	42
12-16ml (16x100mm)	16.2	7224	42	28	42
15ml Falcon/Corning conical)	17.3	7230(7234)	24	16	24
30-37ml (IEC22055,2047,2802,2847)	25.5	7223	18	12	18
46-52ml(IEC1630,2053,2048, 2997,613,2828)	28.6	7222	6	4	6
50ml (Falcon/Corning conical)	229.8	7231	6	4	6
150ml (Corning1265-150)	52.2	7220	6	4	6
250ml (IEC-2050,2051,1625)	63.3	-----	6	4	6

ROTOR 921 6-Place Horizontal Swinging-Bucket						
No. of places	tube volume (ml)	Trunnion /Shield or carrier	speed (max) (rpm)	RCF (max) (xg)	Radius cm (max)	O.D.xLength (mm)
48	1.5-5.0	2760	3300*	1800	14.9	11.0x90
48	3-5	381	3450	2000	15.0	13.6x102
36	8-12	379	3700	2100	13.7	17.7x81
36	8-15	380	3450	2000	15.0	17.7x92
36	10-19	398	3000	1700	16.8	17.7x112
30	3-5	366/369	3950	2450	14.0	12.6x92
24	7-10	366/1018	3700	2400	15.6	14.2x110
18	10-16	366/1013	3525	2225	16.0	16.5x114
24	10-13	354/356	3300	1950	16.0	17.2x110
24	12-19	354/303	3000	1775	17.6	17.2x128
24	15-19	354/302	2700	1600	19.5	17.2x146
24	20-25	354/306	2350	1450	23.3	17.2x186
18	10-13	355/356	3500	2200	16.0	17.2x119
18	12-19	355/303	3200	2025	17.6	17.2x135
18	15-19	355/302	2900	1825	19.5	17.2x156
18	20-25	355/306	2400	1500	23.3	17.2x193
6	10-13	310/356	3900	2725	16.0	17.2x133
6	12-19	310/303	3700	2700	17.6	17.2x147
6	15-19	310/302	3400	2525	19.5	17.2x160
6	20-25	310/306	2850	2125	23.3	17.2x210
12	40-52	326/320	3400	2200	17.0	30.0x127
12	40-52	326/305	2850	1725	19.0	30.0x147
6	40-52	325/320	3800	2700	16.7	30.0x133
6	40-52	325/305	3450	2500	18.8	30.0x153

CENTRAC ADAPTER ROTOR SYSTEMS					
SAMPLE CONTAINER	MAX. DIA. (mm)	CENTRAC ADAPTER CAT. NO.	Number of Tubes		
			949 ROTOR 2350 rpm 1575 xg RAD=25.7 cm	219 ROTOR 3800 rpm 1625 xg RAD=19.2 cm	
5ml (110x75/12x75mm)	12.4	5774(1)	408	-	
0.25 and 0.4ml microtubes	6.1	5737(2)	222	148	
0.5ml and B-D Microtainers	8.1				
5ml (10x75/12x75mm)	12.4				
1.5ml microtubes	11.0	5827(2)	162	108	
7-10ml (13x75/13x100mm)	14.5				
7-12ml (16x75/16x100mm)	18.0	719	114	76	
10-18ml (16x125/17x120mm)	18.0		114	48	
20ml (16x150/16x165)	18.0		42	-	
15ml (Falcon/Corning Conical	17.8	5712	72	24	
15ml (Conical or blood tube)	17.4	5703/7323(3)	18	12	
50ml (Round conical bottom)	29.6	5707	42	28	
50ml (Falcon/Corning Conical)	29.6	5805	30	20	
50ml (Falcon/Corning Conical)	29.6	5807(4)	42	-	
50ml (Falcon/Corning Conical)	29.4	5703/323 (3)	18	12	
50ml (Round bottom)	29.4	5703/1124 (3)	18	-	
200ml (NUNC376813 conical) (5)	63.4	5780	6	4	
175ml (Falcon 2074 conical)(6)	63.4	5780	6	4	
225ml(Falcon2095 conical) (6)	63.4	5780	6	4	
250ml (Corning 25350 conical) (7)	63.4	5780	6	-	
250ml (IEC 2050,2051,1625)	63.4	5780	6	4	
500ml (IEC 2260)	77.1	5781	6	4s	
750ml (IEC 2273)	98.3	-	6	4	
800ml (Bellco 3045) (8)	98.3	-	6	-	

ONLY UNSEALED COMBINATIONS

Notes:
1 Double stacking adapter
2 Includes microtube inserts
3 Order three 7323, 323, or 1124 shields per adapter
4 Triple level adapter
5 Also order IEC 5792 cushions
6 Also order Falcon 2090 cushions
7 Also order Corning 25351-C cushions
8 Also order Bellco 3045-10800 cushions
9 Limited to 4000 rpm
10 Order one 1024 Cytobucket per adapter

5.3 Derating Table for Dense Samples

The Speed and Force Table lists the maximum speed for each rotor/adapter combination in the Model K. IEC guarantees that the unit can achieve these speeds. Faster speeds impose unnecessary wear on the motor.

Caution. Faster speeds with the 244 rotor and the CYTOBUCKET can cause these components to fail.

These speeds are guaranteed only with 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	.1
1.3	.960	.1
1.4	.925	.1
1.5	.894	.1
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

Example. An swinging bucket rotor rated for 2,600 rpm, used with samples with a specific gravity of 1.4, should not be spun faster than (2600 x .925 =) 2400 rpm.

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

$$\sqrt{(s_0/s_a)}$$

...where s_0 is the maximum specific gravity allowed before derating (1.2 or 1.5, depending on the type of rotor), and s_a is the actual specific gravity of the sample in question. You can use the same formula to compute derating factors for specific gravities greater than 3.0.

5.4 Chemical Resistance Table

	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 (DELRIN)
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

5.5 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
Ethylene Oxide Gas	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	U	S	S	S
Dry Heat 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

PA - POLYALLOMER
PC - POLYCARBONATE
PE - POLYETHYLENE
PP - POLYPROPYLENE
PU - POLYURETHANE
NL - MODIFIED PHENYLENE OXIDE (NORYL)
DN - ACETAL HOMOPOLYMER (DELRIN)
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
PT - PAINTED SURFACES
PF - PHENOLIC FIBER

*Autoclaving
121°C 20 min.@
2 ATM (15 PSIG)

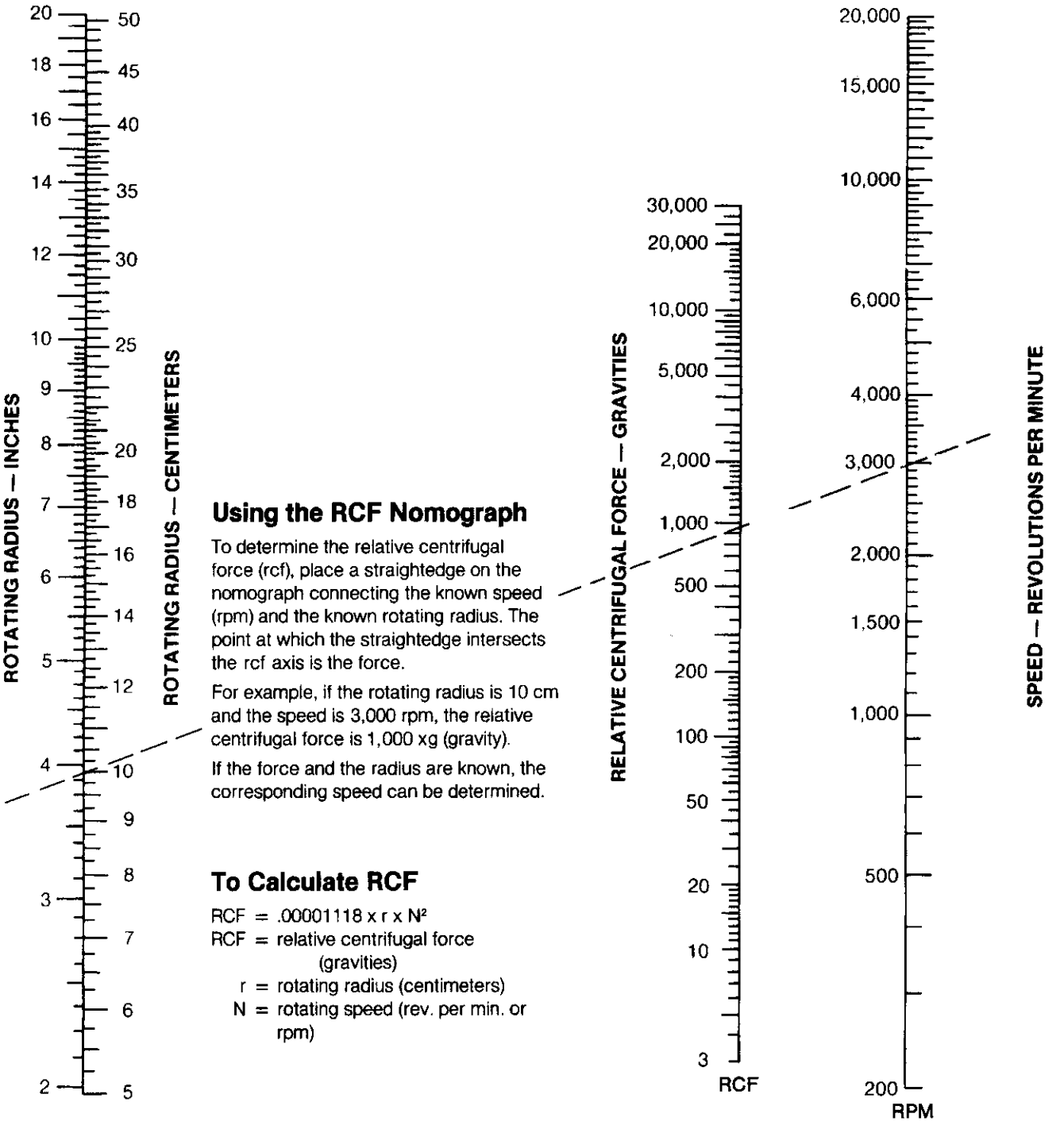
**Household Bleach

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 4.3 Chemical Resistance Table for material compatibility during centrifugation.

5.6 Nomograph



Using the RCF Nomograph

To determine the relative centrifugal force (rcf), place a straightedge on the nomograph connecting the known speed (rpm) and the known rotating radius. The point at which the straightedge intersects the rcf axis is the force.

For example, if the rotating radius is 10 cm and the speed is 3,000 rpm, the relative centrifugal force is 1,000 xg (gravity).

If the force and the radius are known, the corresponding speed can be determined.

To Calculate RCF

$RCF = .00001118 \times r \times N^2$

RCF = relative centrifugal force (gravities)

r = rotating radius (centimeters)

N = rotating speed (rev. per min. or rpm)

6 MAINTENANCE

6.1 Cleaning

Keep your centrifuge clean to ensure good operation and to extend its life. You should clean the entire sample chamber, rotor, and lid at the end of each workday, and also right after any spill.

To clean the sample 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, since these attack metals. Remove stubborn stains with a plastic scrub pad. Do not use steel wool, wire brushes, abrasives, or sandpaper, since they create corrosion sites. Never pour water directly into the sample chamber. Scrub the rotor's tube cavities with a stiff test-tube brush that has end bristles and a non-metallic tip. After cleaning any part, dry it properly, preferably using a clean, absorbent towel.

Cleaning swinging-bucket rotors is necessary to ensure that the buckets can pivot freely. Periodically manipulate each bucket; if you feel resistance or hear squeaking, lubricate all buckets with Bonded Lubricant Coating (BLC), IEC Part No. 7133. Use the following cleaning and lubrication procedure:

1. Wipe the old lubricant from all rotor pins and buckets with a soft, clean, lint-free cloth saturated with solvent such as trichloroethylene.

2. Clean the rotor and buckets as described above. The cleaning step is important because BLC only adheres to a clean surface. If you are unable to remove foreign matter in this way, contact an authorized IEC Service Representative.

3. Shake the bottle of BLC vigorously until all the gray sediment at the bottom of the bottle is dispersed.

4. Use the brush applicator cap to apply a light coating of BLC to the bucket slots only. Do not lubricate the pins. Lubricant will move around the pins during a spin.

5. Give the BLC 1 to 2 minutes to dry. Buff the bucket slots vigorously with a soft, clean, lint-free cloth. Continue until no more BLC rubs off onto the cloth. The surface will be a shiny, light gray.

Corrosion

IEC manufactures and finishes rotors and structural accessories to give maximum resistance to corrosion. However, maximum equipment life requires continual inspection of the rotor cavities for corrosion, especially after using chloride ion solutions such as sodium chloride (saline), and sodium hypochlorite (household bleach). These solutions attack most metals. Clean the rotor, chamber, and accessories (particularly the sample compartments and bucket cups) thoroughly after each such use. Inspect all surfaces under bright light for corrosion; small crevices will grow deeper and cause failure.

If you see any corrosion, remove it immediately as follows:

1. Follow the cleaning procedure at the start of this section. Soak the part in the mild hand-dishwashing detergent. Scrub the part thoroughly with a stiff test-tube brush having end bristles and a non-metallic tip.
2. Soak the part again in clear warm water for at least an hour.
3. Rinse the part thoroughly in warm water first, then in distilled water.
4. Dry the part thoroughly with a clean, absorbent cloth.
5. If this procedure does not remove the corrosion, **discontinue use of the part.**

Storage

Store parts on a soft surface to avoid damaging finished surfaces. Rotors and other parts should be clean and dry for storage. Store them open to the atmosphere, not in a plastic bag, so that any residual moisture will evaporate. The parts should face downward to avoid retaining moisture in the cavities.

Decontamination

Decontamination is called for if tube breakage occurs and infectious, pathogenic, or radioactive material is released into the unit. Some rotors or buckets totally contain the sample tubes. In this case, spillage Is usually confined to the rotor or bucket. If so, it may be sufficient to decontaminate the rotor or bucket.

Sterilization

The Decontamination Table 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 given earlier, 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.

5. Clean the commutator and brushes from oil, dirt, and dust using a small smooth brush and a suitable cleaning fluid.

6. If the brushes are worn, replace them with the new ones. If the commutator is too badly cut or grooved, consult the IEC Service Department.

7. Replace and tighten the brush holder caps.

6.4 Tachometer Rubber Tip

When lowering the tachometer shaft into the sensing position, a rubber tip contacts the rotor shaft so that the tachometer can measure rotation. This rubber tip wears out over time. Using the tachometer only when necessary extends the life of the tip.

You can visually inspect the tip when the cover is open, or you may remove the two tachometer thumbscrews and lift the entire upper casing away from the concentrator cover. If the tip is badly worn, pull it off the tachometer stem and replace it with a new rubber tip (Part No. 5883).

6.5 Fuse Replacement

A user accessible fuse provides over current protection for the centrifuge. If the On/Off switch is in the ON WITHOUT TIMER position and the speed control knob is at or above 35% but you do not hear the motor operate, the fuse may be blown. Proceed as follows:

1. Switch off and unplug the centrifuge.

2. Remove and inspect fuse F1 on the underside of the control box. If the fuse is blown, replace it with a spare fuse. (Part No. 47057 for 120V model; Part No. 1909 for 240V model)

Increasing the speed control setting rapidly may cause the fuse to blow.

If fuses blow repeatedly, or if the unit does not operate and the fuse is not blown, contact the IEC Service Department for repair of the unit.

6.6 Spare Parts

1702	Shaft adapter with wrench and locking nut
1913	Replacement motor brushes (2)
5883	Rubber tip for tachometer shaft
9068	Power cord for 240V models
47057	Fuse, 10A 250V Slo-Blo (120V)
1909	Fuse, 5A 250V Slo-Blo (240V)
50080	Line cord and power plug for 120V models
50081	Power cord for 240V models

Sterilization of rotor and accessories can be done by autoclaving at 121° C. @ 15 psig for 20 minutes. After the rotor and accessories are cool to the touch, do a normal cleaning operation as described above.

Repeated autoclaving will seriously degrade the performance of polycarbonate materials.

6.2 Cover Interlock Bypass

If power fails, the cover remains locked. 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. Use the following procedure:

1 Shut off power to the unit.

2 Remove the plug from the hole located on the left side of the control panel box.

3 Insert a flat-blade screwdriver into this hole. Use the screwdriver to depress the cover lock plunger. While the plunger is depressed, turn the lever 90° to the left to unlock the cover.

4 Release the plunger, withdraw the screwdriver, and reattach the plug.

Do not perform this operation routinely. The centrifuge's cover interlock provides operator safety and lets you open the cover promptly whenever rotation has stopped.

6.3 Brush Replacement

Brush replacement is typically required every 500 hours of actual spin time. Operating the centrifuge with worn brushes will damage the motor commutator. A set of replacement brushes is included with the centrifuge. Order additional sets as IEC Part No. 1913.

The following is the brush replacement procedure:

1. Switch off and unplug the centrifuge.

2. Locate and remove the brush caps covering the brush holders.

3. Remove the brushes, noting their location and orientation. Inspect the brushes. They should not be worn to less than 1/2 inch, and should slide freely in their holders.

4. Inspect the commutator. It should be smooth and free of heavy grooves and scratches.

6.7 Warranty

Warranty information is provided on the warranty card supplied with the centrifuge.

6.8 Condition of Returned Equipment

Before returning equipment to IEC, you must contact IEC's or your dealer's service department and receive a return goods authorization (RGA). **All returned units must be decontaminated, free of radioactivity, and free of hazardous and infectious materials.** The RGA paperwork includes a certificate for you to sign indicating that you have performed these steps. IEC will not accept the shipment unless this signed certificate accompanies it. You must prepay transportation to the service depot.

7 SPECIFICATIONS

Maximum Speed:	5200 rpm
Maximum RCF:	44275 xg
Maximum Volume:	6 liters (6 x 1000 ml)
Operator Controls:	
Rotation:	0% -100% of rated speed
Spin Duration:	2 through 120 minutes Hold mode (indefinite duration)
Speed Indication:	Analog tachometer: 0-6,000 rpm, by 100 rpm
Motor:	Series-wound universal motor
Brake:	Dynamic electric brake; On/Off switch
Time Savings	Approx. 50% compared to coast, from maximum RPM
Power Requirements	
Voltage:	120 VAC (± 10%) or 240 VAC (± 10%)
Frequency:	48-62 Hz
Power:	Dedicated 15A line (120V) Dedicated 10A line (240V)
Heat dissipation (typical):	485 watts (1650 BTU/hour)
Dimensions	
Height:	140 cm (55 in) (with cover open) 94 cm (37 in) (with cover closed)
Width:	79 cm (31 in)
Depth:	61 cm (24 in)
Guard bowl:	58.4 cm (23in) (inside diameter)
Shipping Dimensions	
Height:	104 cm (41in)
Width:	89 cm (35in)
Depth:	76 cm (30in)
Volume:	0.7 cubic meters (24.9 cu. ft.)
Weight:	193kg (425 lbs) (shipping weight) 163kg (360 lbs) (net weight)

Specifications subject to change without notice.