Grafco®
A Graham-Field Brand

Hematocrit Centrifuge
Model 410E
User Manual

Read this manual before operating the 410E Hematocrit Centrifuge. Save this manual for future reference.

410E-INS-LAB-RevA08

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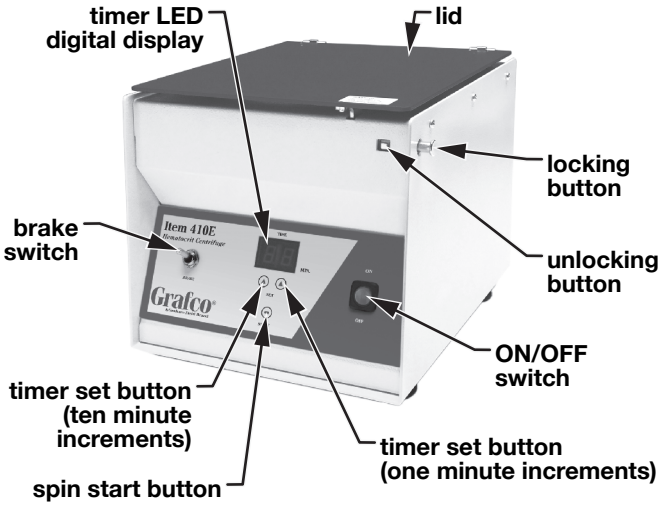
INTRODUCTION

Your Grafco Hematocrit Centrifuge has been designed to be reliable, safe, and easy to use. This manual contains important operation and safety information. Carefully read and understand the contents of this manual before installing or using the Grafco Hematocrit Centrifuge. Always install this centrifuge in accordance with local electrical parameters.

Product Overview



410E Hematocrit Centrifuge

The Grafco Hematocrit Centrifuge, shown above, features a digital timer (up to 99 minutes), fixed speed, brake control, and a reading scale. This unit spins loads at a fixed speed of 12,000 RPM and includes a thermostat to regulate temperature. The Grafco Hematocrit Centrifuge can hold up to 24 capillary tubes of size 1.2mm (or 1.5mm) x 75mm.

Centrifugation of anticoagulated whole blood results in the packing of red blood cells. The hematocrit reading is the percentage of the volume of packed red cells in relation to the volume of whole blood. The hematocrit tube is filled with anticoagulated whole blood, one end sealed by heat or insertion into a sealing clay, and then centrifuged. Interpretation of the resulting **Volume of Packed Red Cells** (VPRC) may be used to detect the presence of anemia or polycythemia.

Glossary

Hematocrit Centrifuge: An instrument which uses centrifugation to measure the ratio of the volume of red blood cells to the total volume of blood.

G Force: The measurement for samples undergoing the stress of acceleration in a centrifuge.

RCF (Relative Centrifugal Force): The centrifugal force that the samples undergo, which relies on the speed of rotation (N) in RPM and the rotating radius (R). The rotating radius is measured from the center axis of the rotor to the extreme ends of the centrifuge tubes.
RCF Formula: $RCF = 11.18 \times R \times (N/1000)^2$

Intended use

The Grafco Hematocrit Centrifuge is intended to provide laboratory tests for hematocrit values (HCT) in the fields of biochemistry, microbic immunity genetics, and blood separation, as well as general clinic tests.

Replacement parts

Replacement parts available for the Grafco 410E Hematocrit Centrifuge (from your Graham-Field authorized distributor): Graham-Field Item 410E-1, Replacement Carbon Brushes, package of two.

IMPORTANT SAFETY GUIDELINES— PLEASE READ BEFORE USE

The safety statements presented in this chapter refer to the basic safety information that the operator of the centrifuge shall pay attention to and abide by. There are additional safety statements in other chapters or sections, which may be the same as or similar to the following, or specific to the operations.

⚠WARNING: Indicates a potential hazard situation or unsafe practice that, if not avoided, could result in death or serious personal injury.

▲Caution: Indicates a potential hazard or unsafe practice that, if not avoided, could result in minor personal injury or product/property damage.

Note: Provides application recommendations or other useful information to ensure that you get the most from your product.

⚠WARNING: Important! Read and understand these instructions before installing or using the Grafco 410E Hematocrit Centrifuge. If you do not understand any part of these instructions, contact your medical professional or Graham-Field authorized distributor for direction in the use of this product.

⚠WARNING: For the safety of both the operator and service personnel, take care when handling substances that are known to be toxic, radioactive or contaminated with pathogenic microorganisms when using this centrifuge.

⚠WARNING: If components are damaged or missing, contact your Graham-Field authorized distributor immediately. DO NOT use substitute parts.

⚠WARNING: GF Health Products, Inc. assumes no responsibility for any damage or injury caused by improper installation or use of this product.

SETUP

Unpacking

1. Check for obvious damage to the carton or its contents. If damage is evident, please notify the carrier and GF Health Products, Inc.
2. Open the product box carefully. This may include cutting external packaging strips which surround the product shipping box. Also, for added safety when shipping, the centrifuge may sometimes be packaged inside the outer shipping box, meaning two boxes must be opened.
3. Carefully remove the Hematocrit Centrifuge from the packaging, including removing the plastic bag in which the centrifuge is placed for shipping purposes. **Do not drop the centrifuge.** Ensure that all of the equipment listed in Contents, following, is present.
4. Keep the packing materials for transportation and/or storage.

Contents

Your Grafco Hematocrit Centrifuge contains:

	Quantity	Description
Equipment supplied with 410E	1	Rotor with lid
	1	Detachable power cord
	1	Reader scale

Installation

▲ **Caution: The operation of AC motor is affected by the surrounding power consumption, which will result in a fluctuation of speed. To assure an accurate RPM and its corresponding RCF, do not place this equipment in draft, sunlight or near a piece of equipment that emits heat and/or electromagnetic conduction emission.**

1. Place the centrifuge in a large, open space with unencumbered air flow on a sturdy, flat, level countertop with sufficient clearance to open the lid completely.
2. Attach the product's electrical cord to the cord port located on the back of the centrifuge.
3. Plug the centrifuge's power cord into a properly grounded (110V / 60Hz) electrical wall outlet.

⚠**WARNING: Locate the unit so that the centrifuge will not be accidentally pulled or dislodged from the countertop; and so the cord will not be stepped on, tripped over, or otherwise subjected to damage or stress.**

SPECIMEN COLLECTION

Materials Needed:

Capillary tubes	**If non-anticoagulated blood is used for the procedure, we recommend the use of heparinized capillary tubes** **If blood is already anticoagulated, we recommend the use of plain capillary tubes**
Clay sealant	
Centrifuge with rotor which will accept capillary tubes and attain at least 11,500RPM	
Chart for determining hematocrit values	

Capillary Tube Specifications

Capillary Tubes	**Heparinized: Plain**	**I.D. 1.1 – 1.2mm, wall 0.2mm + 0.02mm, length 75mm**
	Precalibrated: Heparinized	**I.D. 0.5 – 0.6mm, O.D. 1.4 – 1.7mm, length 75mm**
	Calibration line 60mm from one end	

Tube Preparation

1. Using 2 capillary tubes, insert an end of each into the blood, tilt slightly and allow the tubes to fill by capillary attraction to 2/3 – 3/4 full.

2. Create a sealing plug: Insert the dry ends of the tubes into the sealing clay and withdraw them with a twisting motion.

OPERATION

Balanced Loads

▲ **Caution: Your centrifuge must contain a balanced load in order to work properly. Spinning unbalanced loads may shorten the life of the device and produce unpredictable results. Observe the following rules when loading the rotor.**

- Opposing rotor grooves must be empty or loaded with equally weighted samples.
- If an odd number of samples is to be spun, fill a tube with water to match the weight of the unpaired sample and place it across from the unpaired sample.

Loading the Rotor

The Grafco Hematocrit Centrifuge can hold up to 24 capillary tubes of size 1.2mm (or 1.5mm) x 75mm.

1. Open the centrifuge lid (if centrifuge lid is locked, press the unlocking button on front of centrifuge to unlock it).
2. Turn the rotor lid knob counter-clockwise to unlock the it. Open the rotor lid.
3. Carefully place the test tubes in the rotor grooves, ensuring the capillary tubes touch the rotor's outer rubber gasket.
4. Make sure the load is balanced by placing similar tubes across from one another. This will keep the rotor in balance (see previous section, Balanced Loads).
5. Close the rotor lid gently. Turn the knob clockwise to lock it.

⚠WARNING: Closing the rotor lid improperly may result in broken capillary tubes, which could cause injury.

6. Close the centrifuge lid completely. Press the locking button on the side of the centrifuge to lock the lid.
7. Turn the ON/Off switch to ON position.

Setting the Digital Timer

- The Grafco Hematocrit Centrifuge is equipped with an LED digital display timer which allows the user to spin the load from 1 to 99 minutes.
- Press the triangle directly below the left side of the timer to change the spin time in increments of ten (10) minutes.
- Press the triangle directly below the right side of the timer to change the spin time in single minutes.
- For example, if the desired spin time is twenty five minutes, press the left arrow twice to display a 2 on the timer and press the right arrow five times to display a five on the timer.

Operating the Centrifuge

⚠WARNING: As a safety feature, the centrifuge has a power shut-off device to turn the power off automatically when the lid is opened during spinning. This is a safety feature of the centrifuge. DO NOT open the lid when the rotor is spinning.

1. After the desired spin time is displayed on the timer, press the START button to initiate rotor spinning.
2. The timer will display the spin time remaining during operation. When the spin cycle is complete, the unit will slowly stop spinning.
3. To accelerate the deceleration, press the BRAKE SWITCH.

4. Once the rotor has completely stopped spinning, turn the ON/OFF switch to OFF position.
5. Press the unlocking button located on the front of the centrifuge to unlock the lid. Open the centrifuge lid.
6. Carefully open the rotor lid and remove the specimens.

⚠**WARNING: DO NOT open the centrifuge lid until the rotor has completely stopped spinning. Opening the lid before the rotor has stopped spinning could result in personal injury.**

INTERPRETING RESULTS: USING THE READING SCALE

1. Remove the capillary tubes from the rotor. **Take care not to let the blood drain from the tubes.**
2. Place the capillary tubes on the grooves of the tube holder carefully. Line up the bottom red blood cells portion of the tube with the straight line at the bottom of the reading scale so that the start of the red blood cells portion lines up with this horizontal fixed line.
3. Move the tube holder from left to right on the reader until the top of the Leucocyte line matches up with the fixed diagonal line on the reader platform.
4. Move the adjustable bar to meet the demarcation (place where the Leucocyte and red blood cells separate). The diagonal line on the adjustable bar should be directly on top of the demarcation.
5. The percentage of HCT can then be read directly from the scale by reading the number the adjustable diagonal bar crosses at the right side of the reader.

Expected Value

Normal hematocrit values will vary somewhat depending upon such factors as age, sex, size of red cells, and altitude. Generally accepted normal values with range of variation are:

- Women: 36 – 46%
- Men: 42 – 52%

Limitations and Factors Affecting Results

1. Inadequate centrifugation, either time or RPM, will result in erroneously high reading.
2. Ensure that the capillary tube is sealed properly, to prevent red cell loss during centrifugation. The rubber gasket encircling the interior of the rotor must be smooth and pliable. This will aid in clay sealing plug retention and reduce breakage during centrifugation.
3. Take the reading from the top of the clay sealing plug to the top of the column of VPRC.
4. Hemolized blood, due to over-anticoagulation or improper finger stick, can produce erroneous results.
5. Hematocrit determinations are not accurate immediately following blood transfusions or blood loss.

DISASSEMBLY

⚠WARNING: Disassembly or dismantling of this centrifuge is limited to authorized service personnel only. Dismantling or disassembly by non-qualified personnel will result in the voiding of the unit's warranty. Please contact your Graham-Field authorized distributor or customer service representative to identify a qualified technician.

TROUBLESHOOTING

⚠WARNING: Unplug the centrifuge before performing troubleshooting corrective actions.

⚠WARNING: Do not disassemble or dismantle the centrifuge.

Problem	Possible cause	Corrective action
Can't turn centrifuge ON	1. Blown fuse 2. Disconnected electrical cord 3. Worn carbon brushes	1. Contact Graham-Field authorized distributor to replace fuse (10A) 2. Connect electrical cord 3. Contact Graham-Field authorized distributor to replace carbon brushes
Erratic speed	Worn carbon brushes	Contact Graham-Field authorized distributor to replace carbon brushes
Vibration	Unbalanced rotor	Balance rotor load
Imbalance	1. Tubes are improperly positioned (unbalanced load) 2. Rotor lid is not locked	1. Balance load 2. Screw rotor knob to lock lid
Broken test tubes	1. Tubes are improperly positioned (unbalanced load) 2. Tubes are not placed all the way down 3. Rotor lid is tightened incorrectly	1. Balance load 2. Place tubes against rubber gasket on rotor 3. Ensure rotor lid is placed flat against rotor

MAINTENANCE

⚠WARNING: Centrifuge disassembly or dismantling is limited to authorized service personnel only.

⚠WARNING: Always use a properly grounded electrical outlet of correct voltage and current handling capacity.

▲Caution: Do not lubricate the drive motor or linkage assembly.

▲Caution: Do not immerse the centrifuge in or saturate it with water.

▲Caution: Do not drop the centrifuge, turn it upside down, or subject it to vibration.

▲Caution: Clean the chamber and rotor after each use.

▲Caution: In order to spin balanced loads, the centrifuge must be level. To this end, confirm the rubber supports are in good condition before each use.

▲Caution: Contact your Graham-Field authorized distributor to replace the carbon brushes yearly or as needed.

Cleaning

Clean the equipment as described below after each use.

1. Unplug the unit and disconnect the power cord from the unit.
2. Clean the outer case, rotor lid, and rotor tube holder grooves with a moist, clean cloth.
3. Ensure the equipment is thoroughly dry. Attach the product's electrical cord to the cord port located on the back of the centrifuge.
4. Plug the centrifuge's power cord into a properly grounded (110V / 60Hz) electrical wall outlet.

▲Caution: Do not immerse the centrifuge in or saturate it with water.

▲Caution: DO NOT use benzine or paint thinner for cleaning.

Transportation

▲Caution: When transporting the unit, place in secure packaging (preferably the original packaging material) which will prevent the unit from tipping over.

▲Caution: Do not drop the centrifuge, turn it upside down, or subject it to vibration.

▲Caution: Transport within temperature limitations listed in following SPECIFICATIONS section.

Storage

▲Caution: Do not place this equipment in a draft, sunlight or near a piece of equipment which emits heat or electromagnetic conduction emission.

▲Caution: Disconnect power supply when the centrifuge is not in use.

▲Caution: DO NOT place other equipment or objects on top of the centrifuge.

▲Caution: Store within temperature limitations listed in following SPECIFICATIONS section.

SPECIFICATIONS

Model	Grafco 410E Hematocrit Centrifuge
CE marking	Conforms to LVD 73/23 EEC safety standards.
Standard	Complies with EC Electromagnetic Compatibility requirement of EN60601-1-2.
	EMI filter is designed in conformity with 89/336 EEC-EMC Directive.
	Complies with IEC801 series regulations.
	Complies with EN standard
	ISO9001, ISO13485, GMP
N.W.	25.35 lb (11.5 kg)
Timer	Digital, 1 to 99 minutes
Motor input	Brush 80W
Brake	Manual
Rotor	F-2415
Capacity	24 capillary tubes
Max RCF	14490 x g
Speed RPM	Fixed 12,000
Capillary tube size	1.1 – 1.2mm x 75 mm (length)
Conditions for Transportation and Storage	Temperature: 50ºF – 104ºF (10ºC – 40ºC)
	Humidity: 40% – 90%

LIMITED WARRANTY

Your Grafco Hematocrit Centrifuge product is guaranteed to be free from defects in materials and workmanship for one (1) year under normal use from the date of purchase.

This WARRANTY does not apply to any product damaged by misuse, abuse, neglect, improper line voltage, dropping, fire, water submersion or saturation. The warranty is voided if non-authorized representatives service or dismantle the centrifuge. The warranty is voided if damage occurs as a result of the lid being opened when the rotor is spinning.

The liability of GF Health Products, Inc. is limited to repair or replacement and under no circumstances shall GF Health Products, Inc. be liable for any collateral consequential damages or losses. This guarantee specifically excludes the expendables and consumables.

Direct warranty claims to GF Health Products, Inc. must be directed to the distributors or agents authorized by GF Health Products, Inc. responsible for the sale of this equipment.

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