Benchtop Centrifuge
Model: UGL16

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1 Safety Instructions and Features

1.1 Safety Instructions

The use of Personal Protection Equipment (PPE) is REQUIRED.

Follow all federal, state and municipal laws, codes and ordinances.

Please make sure the power connection is correct and well-grounded. (see the technical parameters for details)

Apply a rag to wipe the parts clean after washing away stains; do not use hard objects.

Do not use flammable, corrosive or explosive substances on, in, or near the equipment.

If there is a problem, do not continue to use the centrifuge.
Contact us immediately.

Safety Precautions and Explanations

At USA Lab, safety is our number one priority. The following information provides guidelines for safety when using USA Lab equipment. Any piece of machinery can become dangerous to personnel when improperly operated or poorly maintained. ALL employees operating and maintaining USA Lab equipment should be familiar with its operation, thoroughly trained, and Instructed on the best safety practices. Most industry accidents are preventable through safety awareness.

Training

It is the responsibility of the customer to ensure that all personnel who will be expected to operate or maintain the equipment. Participate in training and instruction sessions to become trained operators. All personnel operating, inspecting, servicing, or cleaning this equipment must be properly trained in the operation and machine safety. **BEFORE** operating this equipment, read the operating instructions in this equipment manual. Become thoroughly familiar with the machinery and its controls.

1.1 Safety

Never leave the equipment running unattended and use this equipment only for its intended purpose.

Ensure that all power sources are turned off when the machine is not in use. This encompasses electrical and pneumatic power.

Read the manual for any special operational instructions for each piece of equipment. All USA Lab authored manuals are typically included with each device as well as posted online.

Know how the equipment functions and understand the operating and halting processes.

Wear the appropriate personal protective equipment for the task.

When working on or around all equipment, avoid wearing loose clothing, jewelry, unrestrained long hair, loose ties, belts, scarves, or articles that may be caught in moving parts. Keep all extremities away from moving parts. Entanglement can cause death or severe injury.

For new equipment, check input voltage and compare with the equipment voltage rating. DO NOT supply the incorrect power to any equipment for any reason whatsoever. Electrical specifications for your machine are printed on the machine tag. A properly grounded receptacle is required for safe operation regardless of voltage requirements.

Keep the equipment operating zone free of obstacles that could cause a person to trip or fall toward an operating machine. Keep fingers, hands, or any part of the body out of the machine and away from moving parts when the machine is operating.

Any machine with moving parts and/or electrical components can be potentially dangerous no matter how many safety features it contains. Stay alert and think clearly while operating or servicing the equipment. Be aware of operations and personnel in your surroundings. Be attentive to indicator lights, warning lights, and/or operator interface screens displayed on the machine and know how to respond.

Do not operate machinery if you are fatigued, emotionally distressed, or under the influence of drugs or alcohol.

Know where the FIRST AID SAFETY STATION is located.

Know where the FIRE EXTINGUISHING EQUIPMENT is located.

Never sit or stand on the machine or on anything that might cause you to fall against the machine.

Rotating and moving parts are dangerous. Keep clear of the operating area. Never put any foreign object into the operating area.

Use proper lifting and transporting devices for heavy equipment. Some types of equipment can be extremely heavy. An appropriate lifting device should be used.

Use caution when moving portable equipment. In some cases, the machinery can be heavy and/or may be top heavy. Portable equipment can gain momentum during transportation and must always be controlled.

When operating this centrifuge, please pay close attention to the following points to prevent damage to property or personnel.

1. Disconnect the main power plug if the machine is not used for a long period or during maintenance.

2. Do not operate the centrifuge with an unbalanced load. Unbalanced operation is strictly prohibited.

3. Do not exceed the maximum speed (RPM) specified for the rotor, otherwise serious harm may occur. Always inspect the rotor before use, including the maximum RPM listed on the rotor.

4. If any cracks appear on the rotor body, do not use the rotor. Continued use may lead to risk of property or personnel. Contact us for a replacement rotor.

Symbols and Warnings

Below are examples of commonly used symbols and what they mean.
Understand them and their potential consequences.

High Voltage or Electrical Hazard

Explosive Hazard

Not User Serviceable

Flammable Hazard

Hot Surface or Steam Hazard

1.2 Features

The USA LAB Benchtop Centrifuges are a laboratory instrument used for centrifugal segmentation in medical and biological applications. The unit employs several safety and convenience features as follows:

Motor & Control:

Brushless DC motor (no carbon brush replacement needed)
Microprocessor-controlled electrical system
LCD screen display for speed, time, and parameters
Touchscreen programming interface

Display & Operation:

Conversion display between speed (RPM) and RCF during operation
Automatic storage of operating parameters for next use
Up to 100 saved programs
Curved speed operation mode

Safety Features:

Electronic safety door lock (won't start if lid is not closed)
Door cannot be opened during operation
Over-speed protection (stops if speed exceeds max by 500 rpm)
Motor fault protection
Unclosed door protection
Emergency pull ring for power failure situations
Automatic stop when timer reaches zero

1.3 Technical Parameters

Maximum speed: 16000 rpm
Maximum RCF (Relative Centrifugal Force): 20600×g
Maximum capacity: 6 × 100ml
Speed accuracy: ±20 rpm
Noise level: ≤58 dBA
Timer range: 0~99 hours, 99 minutes, 59 seconds
Power supply: AC 110V 60Hz 12A
Chamber Temperature: -20°C to 40°C
Temperature Accuracy: ±1°C

2 Rotor Options and Operational Guidelines

2.1 Rotor Options

Part Number	Rotor Type	Maximum RPM	Configuration (not capacity)	Maximum RCF
NO 05105	Fixed Angle	15000	30 x 0.5ml	18510
NO 05106	Fixed Angle	14000	40 x 0.5ml	19970
NO 05101	Fixed Angle	16000	12 x 1.5ml / 2ml	17940
NO 05102	Fixed Angle	15000	24 x 1.5ml / 2ml	20600
NO 05103	Fixed Angle	13500	30 x 1.5ml / 2ml	19340
NO 05104	Fixed Angle	13000	48 x 1.5ml / 2ml	17930
NO 05107	Fixed Angle	15000	16 x 5ml	19350
NO 05108	Fixed Angle	14000	12 x 7ml	16370
NO 05109	Fixed Angle	14000	6 x 10ml	16460
NO 05110	Fixed Angle	12000	12 x 10ml	14510
NO 05113	Fixed Angle	11000	8 x 15ml	12730
NO 05114	Fixed Angle	10000	12 x 15ml	11840
NO 05116	Fixed Angle	12000	8 x 20m	14510
NO 05117	Fixed Angle	12000	6 x 30m	14000
NO 05120	Fixed Angle	11000	6 x 50m	13480
NO 05122	Fixed Angle	7000	8 x 50m	6190
NO 05128	Fixed Angle	10000	4 x 100ml	10310
NO 05129	Fixed Angle	10000	6 x 100ml	11380
NO 05140	Fixed Angle	5000	24 x 15ml	3500
NO 05216	Swing Bucket	4000	2 x 3 – 48-Well Plates	2300

2.2 Operational Concepts and Guidelines

The concept of centrifugation will induce gravitational particle segmentation caused by RCF (Relative Centrifugal Force). By which, the lighter molecules will be on top, and the heavier molecules will be on the bottom.

How to calculate RCF:

$$RCF = 11.2 \times R \times \left(\frac{N}{1000} \right)^2$$

R = Radius
N = RPM / Speed
The transfer coefficient of 11.2 is an approximate value, which is calculated according to the acceleration of gravity（1g = 9.81m/s 2）

Calculating separation time:

Separation time is inversely proportional to the solution's particle density ratio. A larger difference will result in a shorter run time. Whereas a smaller difference in the solution's particle density will result in a longer run time. Additional factors such as the rotor design and test tube length will increase or decrease the required run time. The lower the RCF setting, the longer the separation time.

It is important to note that these calculations assume spherical particles and a constant fluid viscosity. For non-spherical particles or complex fluid dynamics, the results may require empirical correction. Additionally, the actual path length in inclined rotors may differ from the radial distance, requiring adjustments to the radius values used in the calculation.

3 Control Panel Operation and Program Outline

3.1 Control Panel Operation

The instrument's control panel features separate segments displaying the speed, time, and other parameters. The switches and buttons are identified in the figure below.

Initial Start Page

1. Operation Status
2. Selected Rotor Information
3. RPM / Speed
4. RCF / Force
5. Acceleration Rate
6. Deceleration Rate
7. Selected Program Number
8. Timer Area
9. Temperature Setting and Readout
10. Settings Page
11. Start Program Button
12. Open Lid Button
13. Lid Status Indicator

Rotor Selection Page

Running Program Page

1. Lid Status Indicator
2. Rotor Information
3. Timer Setting
4. Timer Remaining
5. Motor Status: Stopped, Accelerating, Running, and Decelerating.
6. Set RPM / Speed
7. Change RPM / RCF Readout Units
8. Current RPM / RCF Readout
9. Acceleration Rate
10. Deceleration Rate
11. Curve Mode
12. Stop Button

3.2 Setting Parameters

Press the Digits / Characters to select the display area you wish to modify; the value in the selected area will open a modification prompt / keyboard.

Then type the desired value to set the parameter.

Once All parameters are correct press the start button to begin the operation. The instrument will operate according to the set parameters.

When the time counts down to 00:00, the instrument will stop and open the lid automatically.

Using and saving stored parameters:

To enable operators to run the instrument more quickly, the parameters can be stored into memory. When you need to use the stored parameters. Parameters are stored into memory by pressing “Storage”. When parameters are stored, the unit will emit a "beep..." sound, and the screen will display that the program is saved.

Stopping:

When the timer counts down to zero (or when the Stop button is pressed), the stop indicator light will turn on, and the rotational speed will start to decrease. When the rotational speed drops to zero, the instrument will stop operating, and the buzzer will emit six beeps —this indicates that the instrument has stopped operating.

Opening the lid:

Press the Open button. When you hear a “click” sound, the door lock is released. Pull the door lid upward.

For your safety, pressing the Open button during the instrument’s operation will have no effect on the lid opening. Instead, the operation will stop, and the lid will automatically open when the RPM has dropped to zero.

Error Codes:

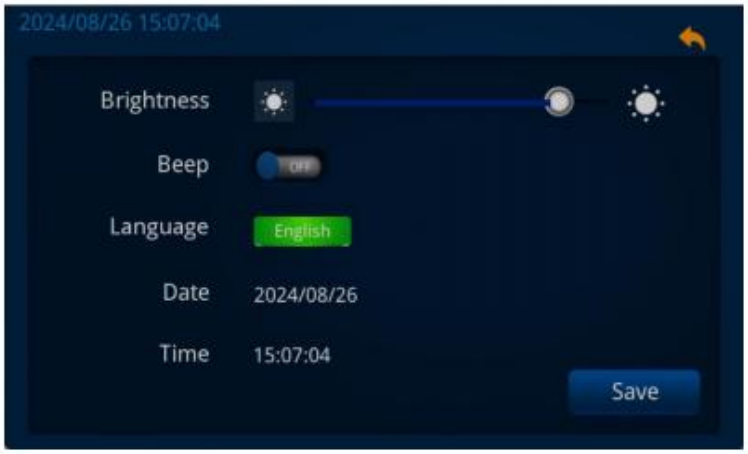
ERR0 – Overloaded beyond capacity.
ERR1 – Indicates that the lid is not closed.
ERR2 – Motor not rotating / Motor locked up.
ERR3 – Input voltage too high.
ERR4 – Motor being provided too much current.
ERR5 – Temperature sensor failure (If applicable).
ERR6 – Temperature setting exceeded (if applicable).
ERR7 – Speed sensor failure.
ERR8 – Over speed alarm.
ERR9 – Unbalanced load.
ERR10 – Door lock motor sensor failure – open circuit. Signal not detected within 3.5s.
ERR11 – Door lock motor sensor failure – closed circuit. Signal not detected within 3.5s.
ERR12 – Input voltage too low.
ERR13 – Phase loss (if applicable).
ERR14 – Motherboard communication failure.
ERR15 – Motherboard fault.
ERR16 – Door lock motor position switch connection fault (reversed).

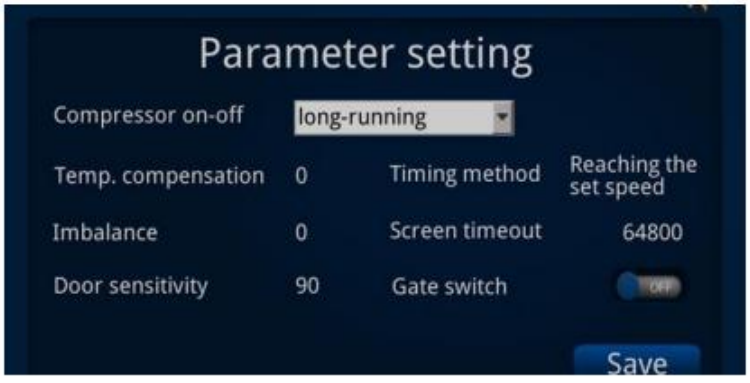
3.3 Programming Notes

Up 100 programs can be stored in memory. Rotor number, speed, time, acceleration, deceleration are all saved into the program.

Acceleration and deceleration:
For lighter rotors and loads. Use a higher acceleration / deceleration rate.
For heavy rotors and loads. Use a lower acceleration / deceleration rate.

Settings pages





4 Preparing for Installation

1. Please refer to the packing list to check whether the components and parts are included. If there are any missing parts, please contact us immediately.
2. Remove any residue before assembly and keep all surfaces clean.
3. A professionally installed NEMA receptacle. See electrical specifications in section 1.3.

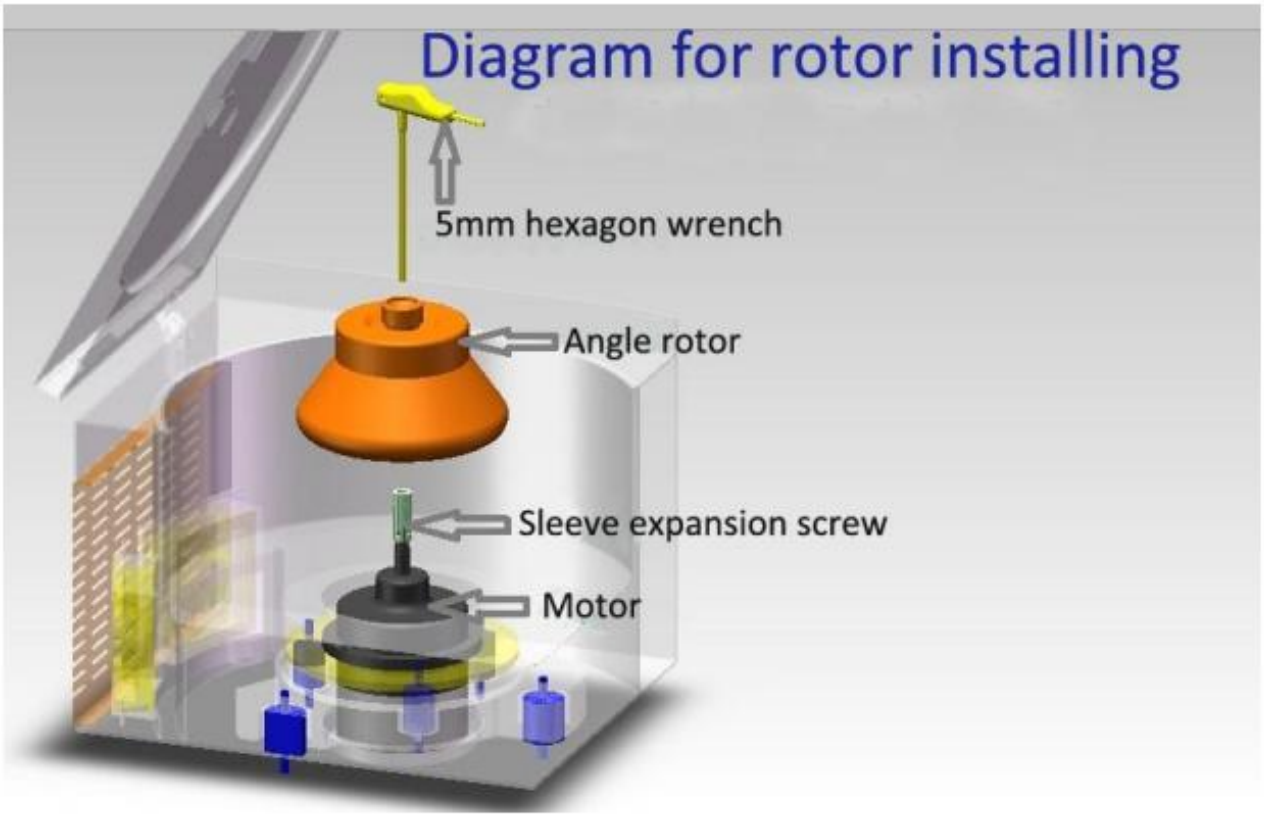
5 Instructions for Installation

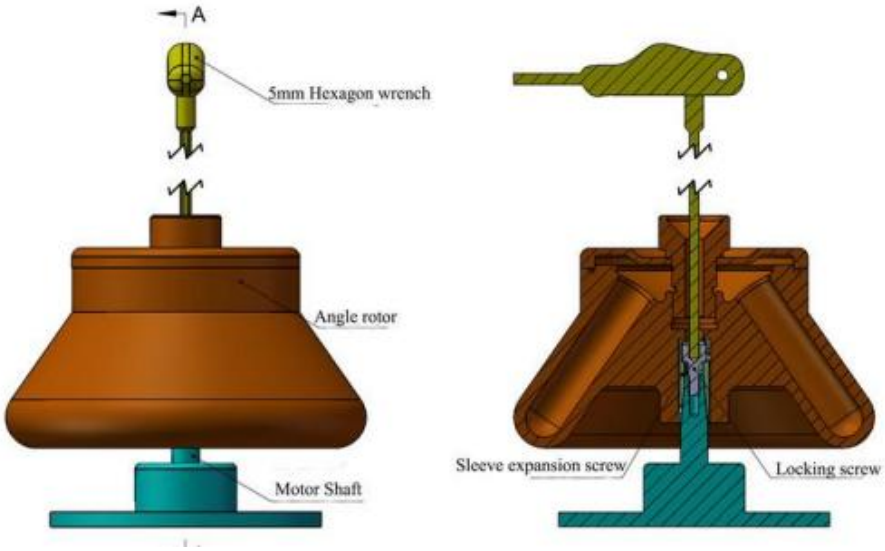
Steps:

Clean and level the benchtop work surface.
Open the crate fully and place the centrifuge on the benchtop. (the lid will be open / unlocked)
Remove all items and unwrap. Laying them out for assembly.
Connect the power cord to the rear of the unit. Keep power switch off until the rotor has been installed and the basin is clear of all debris and tools.
Proceed to install the rotor. Steps on the following page.
Note: Some units will come with the rotor preinstalled. With swing bucket rotors, inserts may need to be installed. Each rotor type will require a specific bolt length or type eg Sleeved expansion screw or swing bucket rotor screw.
Turn the unit on and program the desired parameters as outlined in sections 3.1 and 3.2.
Close the lid and run the centrifuge without a load.
Once the unit has run through the program as desired. You may use the unit with a load.

Please follow all laboratory safety guidelines and regulations. Refer to the laboratory manager if you have any operational or safety questions or concerns.

Rotor Installation:





Check the motor shaft for a pre-installed bolt. If installed, DO NOT remove the bolt before placing the rotor on the motor shaft. This is the sleeved expansion screw. After the rotor is added to the shaft, tightening the screw will expand the shaft to secure the rotor to the shaft.

The rotor should not move up and down the motor shaft when installed correctly.

Only tighten the bolt when the rotor is in fully downed position.

6 Notes

6.1 Storage

For long periods, please disconnect the power. Empty and clean the basin, rotor, inserts, and exterior. Store covered in a level location.

7 Maintenance

Shut off the power switch and disconnect the power cord before any maintenance.
Use a damp soft cloth to wipe clean. Stubborn stains should be cleaned by neutral detergents.
The maintenance of internal electrical and heating parts must be performed by professionals or trained electricians.
Do not directly splash water over the product or use abrasive powder, diluent, oil, kerosene, acidic material and similar substances during cleaning, or else shock or other accidents will occur.

Please refer to our website for any policy information such as returns, warranty, or after-sales service.