Benchtop Centrifuge
Model: UD4B

Index

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
- Push-button programming interface

Display & Operation:

- Conversion display between speed (rpm) and RCF during operation
- Automatic storage of operating parameters for next use
- 12 programmable settings (A-G, H1-H2, I1-I3)
- Gradient separation programs (2-step and 3-step options)

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: 4000 rpm
- Maximum RCF (Relative Centrifugal Force): 2250×g
- Maximum capacity: 6×50ml
- Speed accuracy: ±20 rpm
- Noise level: ≤55 dBA
- Timer range: 1~99 minutes 59 seconds
- Power supply: AC 110V 60Hz 2A

2 Rotor Options and Operational Guidelines

2.1 Rotor Options

Part Number	Rotor Type	Maximum RPM	Configuration (not capacity)	Maximum RCF
NO 05001	Fixed Angle	4000	30 x 5ml	2060
NO 05174	Fixed Angle	4000	12 x 10ml	2150
NO 05177	Fixed Angle	4000	12 x 15ml	2150
NO 05198	Fixed Angle	4000	12 x 20ml	2220
NO 05175	Fixed Angle	4000	18 x 10ml	2250
NO 05179	Fixed Angle	4000	30 x 7ml	2250
NO 05180	Fixed Angle	4000	6 x 50ml	2100
NO 05176	Fixed Angle	4000	24 x 10ml	2200
NO 05242	Fixed Angle	4000	6 x 10ml	2214

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.

1: Program Selection
2: Parameter Selection Button
3: Increase Button
4: Decrease Button
5: Stop Program / Open Lid Buton
6: Running Program Indicator
7: Stop Program Indicator
8: Start Program Button
9: Display Screen

The P/R display area identifies programs A thru‑I3. Programs H1‑H2 (two step) and I1‑I3 (three step) are gradient separation programs.

The SPEED/RCF display area identifies the speed and centrifugal force. To change the unit of measure to RCF. Hold the SEL button until the letter F appears.

The TIME display area identifies the TIMER and has two functions:

1. Displays the centrifugation time. The countdown starts once the rotor reaches the set speed.
2. Displays instrument faults. For example, ERR1 indicates that the lid is not closed.

The ↑ ↓ display area indicates the acceleration and deceleration rates.

3.2 Setting Parameters

Press the SEL key to select the display area you wish to modify; the value in the selected area will flash.

Then use the Increase or decrease buttons 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 door 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. Press the P/R button to recall up the program, then press the Start button to apply and run the stored parameters. Parameters are automatically stored into memory. When parameters are stored, the unit will emit a "beep..." sound, and the LCD screen will flash twice.

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 Program Outline

Program	Speed / RPM	Timer Range	Notes
A	0-4000 (adjustable)	0 – 99:59	
B	0-4000 (adjustable)	0 – 99:59	
C	0-4000 (adjustable)	0 – 99:59	
D	0-4000 (adjustable)	0 – 99:59	
E	0-4000 (adjustable)	0 – 99:59	
F	0-4000 (adjustable)	0 – 99:59	
G	0-4000 (adjustable)	0 – 99:59	
H1	0-4000 (adjustable)	0 – 99:59	Two Step Program
H2	0-4000 (adjustable)	0 – 99:59	H1 ► H2
I1	0-4000 (adjustable)	0 – 99:59	Three Step Program
I2	0-4000 (adjustable)	0 – 99:59	I1 ► I2
I3	0-4000 (adjustable)	0 – 99:59	I2 ► I3

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.

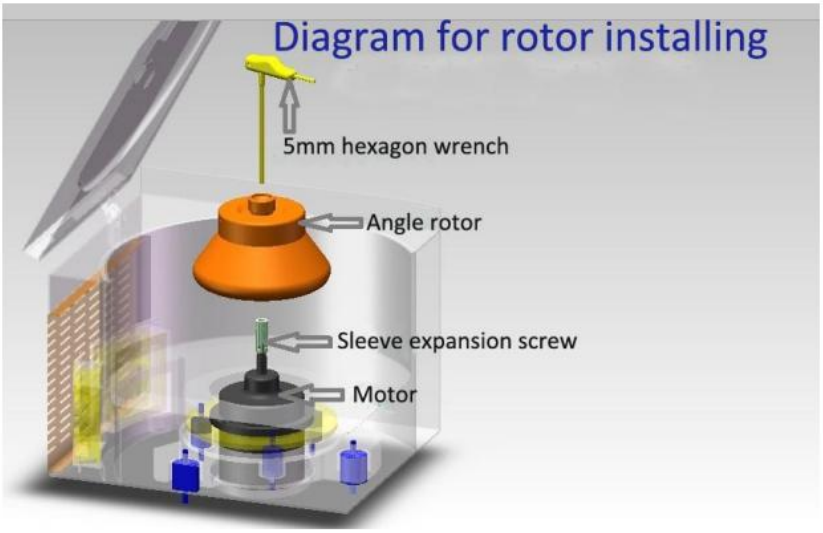
5 Instructions for Installation

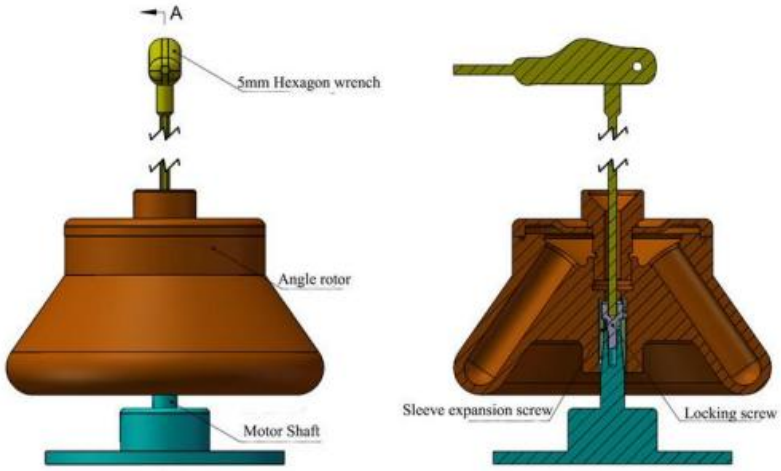
Steps:

- 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:





*The sleeved expansion screw is not applicable to this model. Image shown for reference. *

Check the motor shaft for a pre-installed bolt. If installed, remove the bolt before placing the rotor on the motor shaft.

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

Only insert and 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.