

# Sample Preparation Made Easy



revvity

Centrifuge 101

## What is a centrifuge?

A centrifuge is a laboratory device that uses centrifugal force to separate substances of different densities.

It typically consists of a motor-driven rotor, which holds the sample tubes, and a lid that seals the rotor chamber.

When the rotor spins at a high speed, the heavier substances are pushed to the bottom of the tube, while the lighter substances move to the top. They are widely used in various fields such as medical, cosmetic, dental, chemical industry, food, pharmaceutical, environmental protection, mining, and teaching.

An example of centrifuge use in a clinical setting is for the separation of whole blood components. Different assays necessitate serum or plasma, which may be obtained with centrifugation.

## How does a centrifuge work?

A centrifuge is used to separate particles suspended in a liquid according to particle size and density, viscosity of the medium, and rotor speed.

Within a solution, gravitational force will cause particles of higher density than the solvent to sink, and those less dense than the solvent to float to the top.

Centrifugation takes advantage of even minute differences in density to separate particles within a solution.

As the rotor spins around a central axis, it generates a centrifugal force acting to move particles away from the axis of rotation. If the centrifugal force exceeds the buoyant forces of liquid media and the frictional force created by the particle, the particles will sediment.

## Centrifuge rotor types?

There are two very common rotor designs: fixed angle, and swinging bucket. The fixed angle rotor is designed to hold tubes in a fixed position at a fixed angle relative to the vertical axis of rotation (up to about 45°). Centrifugation will cause particles to sediment along the side and bottom of the tube.

The swinging bucket design allows the tubes to swing out from a vertical resting position to become parallel to the horizontal during centrifugation. As a result, sediment will form along the bottom of the tube.



Fixed Angle Rotor



Swinging Bucket Rotor

Fixed angle rotors are ideal for pelleting applications either to remove particles from a suspension and discard the debris or to recover the pellet, whereas swinging bucket rotors are best for separating large volume samples at low speeds and resolving samples in rate-zonal (density) gradients.

## Centrifuge types?

Centrifuges may be classified based on maximum speeds, measured as revolutions per minute (rpm).

Speed wise they are categorized as low speed centrifuges (up to 7,000 rpm), high speed centrifuges that can reach speeds up to 20,000 rpm or even higher, or ultra centrifuges (speed range from 60,000 to 150,000 rpm).

In laboratories the common types of centrifuges are:

- microcentrifuges (tabletop)
- refrigerated centrifuges (tabletop and floor standing)
- high speed refrigerated centrifuges (tabletop and floor standing)
- ultra centrifuges (tabletop and floor standing)

## What to ask customers?

It is important to ask the following questions to be able to determine which centrifuge and which accessories to offer for a customer's application.

***What sample volume are you working with?***

***What kind of tubes will they be using?***

For example, if they will use vacutainers for blood or urine centrifugation, the best configuration would be a centrifuge with a swing out rotor, and inserts for blood collection tubes

More specifically :-

CF-350 with 450653 - (Four place swing out rotor RS 4/100)

168721 - (B100 Buckets)

168737 - (I100 7/5-7 (Inserts for blood collection tubes 13 x 75 mm)

168723 - (I100 6/10-12 Inserts for blood collection tubes 16 x 100 mm).

This configuration offers 28 or 24 sample capacity per spin.

***What is the speed/rcf required for the application?***

If they process blood and urine samples, the CF-350 with a swing out rotor is suitable because the parameters for blood centrifugation are usually 3500 rpm for 10 minutes, and for urine the parameters are 1500 - 2000 rpm for 5 minutes.

Model	CF-220 Centrifuge	CF-260 Centrifuge	CF-350 Centrifuge
Power Rating	CF-220-120 - 120V, 50/60 Hz CF-220-220 - 220V, 50/60 Hz CF-220-220UK - 220V, 50/60 Hz	CF-260-120 - 120V, 50/60 Hz CF-260-220 - 220V, 50/60 Hz CF-260-220UK - 220V, 50/60 Hz	CF-350-120 - 120V, 50/60 Hz CF-350-220 - 220V, 50/60 Hz CF-350-220UK - 220V, 50/60 Hz
Refrigerated	No	No	No
Max. Power Consumption	450 Watts	450 Watts	500 Watts
Max. Rotation Speed	200 to 15,500 rpm, in steps of 10 rpm	200 to 18,000 rpm, in steps of 10 rpm	200 to 15,000 rpm, in steps of 10 rpm
Maximum G Force	23,100 rcf	31,150 rcf	21,630 rcf
Rotors * Includes aerosol lid  <b>ALL ROTORS, BUCKETS AND INSERTS ARE SOLD SEPARATELY</b>	<b>437480</b> - 24 x 2 mL Microcentrifuge Tubes (15,500 rpm / 23,100 rcf)	<b>228442</b> - 24 x 2 mL Microcentrifuge Tubes (18,000 rpm / 31,150 rcf)	<b>228442</b> - 24 x 2 mL Microcentrifuge Tubes (15,000 rpm / 21,630 rcf)
	<b>449201</b> - 12 x 5 mL Microcentrifuge Tubes (15,500 rpm / 23,100 rcf)	<b>375944</b> - 24 x 2 mL Microcentrifuge Tubes* (18,000 rpm / 31,150 rcf)	<b>375944</b> - 24 x 2 mL Microcentrifuge Tubes* (15,000 rpm / 21,630 rcf)
	<b>447993</b> - 12 x 12 mL Tubes (6,000 rpm / 4,185 rcf)	<b>228451</b> - 30 x 2 mL Microcentrifuge Tubes (14,000 rpm / 21,470 rcf)	<b>228451</b> - 30 x 2 mL Microcentrifuge Tubes (13,000 rpm / 18,520 rcf)
	<b>438526</b> - 8 x 15 mL Tubes (6,000 rpm / 4,185 rcf)	<b>403055</b> - 16 x 5 mL Microcentrifuge Tubes* (14,000 rpm / 21,470 rcf)	<b>403055</b> - 16 x 5 mL Microcentrifuge Tubes* (13,000 rpm / 18,520 rcf)
	<b>438545</b> - 6 x 50 mL Tubes (6,000 rpm / 4,185 rcf)	<b>398241</b> - 6 x 12 mL Tubes (4,400 rpm / 2,600 rcf)	<b>454655</b> - 30 x 12 mL Tubes (4,400 rpm / 3,200 rcf)
	<b>449568</b> - 24 x Glass Hematocrit (15,500 rpm / 23,100 rcf)	<b>448807</b> - 8 x 15 mL Tubes (6,000 rpm / 4,440 rcf)	<b>454656</b> - 30 x 15 mL Tubes (4,400 rpm / 3,200 rcf)
	<b>449767</b> - 4 x 8 PCR Strips (15,500 rpm / 23,100 rcf)	<b>448806</b> - 6 x 50 mL Tubes (6,000 rpm / 4,430 rcf)	<b>448914</b> - 6 x 50 mL Tubes (4,400 rpm / 3,200 rcf)
	-	<b>246701</b> - 24 x Glass Hematocrit (14,000 rpm / 21,470 rcf)	<b>246701</b> - 24 x Glass Hematocrit (13,000 rpm / 18,520 rcf)
	-	<b>273335</b> - 4 x 8 PCR Strips (14,000 rpm / 21,470 rcf)	<b>273335</b> - 4 x 8 PCR Strips (13,000 rpm / 18,520 rcf)
	-	<b>429192</b> - 2 x Microtitration Plates (5,700 rpm / 2,380 rcf)	<b>270848</b> - 2 x Microtitration Plates (3,000 rpm / 830 rcf)
	-	-	<b>450653</b> - 4 x 100 mL Bucket (4,400 rpm / 3,200 rcf)
-	-	<b>383672</b> - 4 x 200 mL Bucket (4,400 rpm / 3,200 rcf)	
-	-	<b>349771</b> - Cytology Rotor (2,500 rpm / 1,030 rcf)	
Time	10 s - 99 min and continuous, step 10 s	10 s - 99 min and continuous, step 10 s	10 s - 99 min and continuous, step 10 s
Programs	100	100	100
Acceleration Levels	10	10	10
Deceleration Levels	10 (Level 0 without braking)	10 (Level 0 without braking)	10 (Level 0 without braking)
Display	LCD with backlight	LED	LED
Noise level (at max. speed)	≤ 60 dBA	≤ 66 dBA	≤ 66 dBA
Fast Spin	Yes	Yes	Yes
Lid Locking Mechanism	Manual closed, motorized open	Motorized	Motorized
Permitted Ambient Conditions	2 to 35 °C, Humidity: 75 %, Non-Condensing	2 to 35 °C, Humidity: 75 %, Non-Condensing	2 to 35 °C, Humidity: 75 %, Non-Condensing
Dimensions	W: 11" (28.0 cm), D: 14.6" (37.0 cm), H: 8.9" (22.6 cm) (H: lid open 19.4" (49.3 cm))	W: 14.2" (36.0 cm), D: 16.9" (43.0 cm), H: 11.3" (28.8 cm) (H: lid open 23.9" (60.6 cm))	W: 15.9" (40.5 cm), D: 19.7" (50.0 cm), H: 12.8" (32.5 cm) (H: lid open 23.9" (60.6 cm))
Weight	31.7 lbs. (14.4 kg)	49.6 lbs. (22.5 kg)	63.9 lbs. (29 kg)
Warranty	One Year	One Year	One Year
Certification	CE	CE	CE

## Safety precautions

A sturdy, leveled install bench is a must.

Balancing the rotor load is very important as an unbalanced rotor can cause damage to bearings and the motor axle and cause inadequate results during centrifugation.

Do not move a centrifuge during centrifugation.

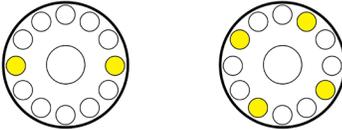
Do not attempt to open the lid while the centrifuge is in a cycle

If you see shaking or wobbling, turn the centrifuge off, or pull the plug

## Rotor balancing

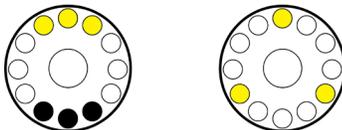
Example on how to balance a rotor:

### Two or four tubes

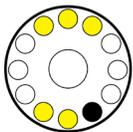


### Balancing, three, five or seven tubes in a twelve place rotor

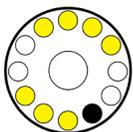
There are two ways to balance three tubes. The first option is to insert three sample tubes next to each other, and create three balance tubes to be situated directly across from the sample tubes. Alternatively, three sample tubes may be spaced evenly around the rotor.



To balance five tubes, create one balance tube and place two sets of three tubes across from each other.



To balance seven tubes, create one balance tube and place two sets of four tubes across from each other.



## Maintaining a centrifuge

A few simple steps can keep a centrifuge functioning properly and reduce the risk of damage:

Ensure all users are aware of how to properly operate the centrifuge, including ensuring buckets are properly seated in their pins, balancing tubes in the rotor, operating rotors within stated guidelines for speed and maximum compartment mass, and avoiding scratching the rotor.

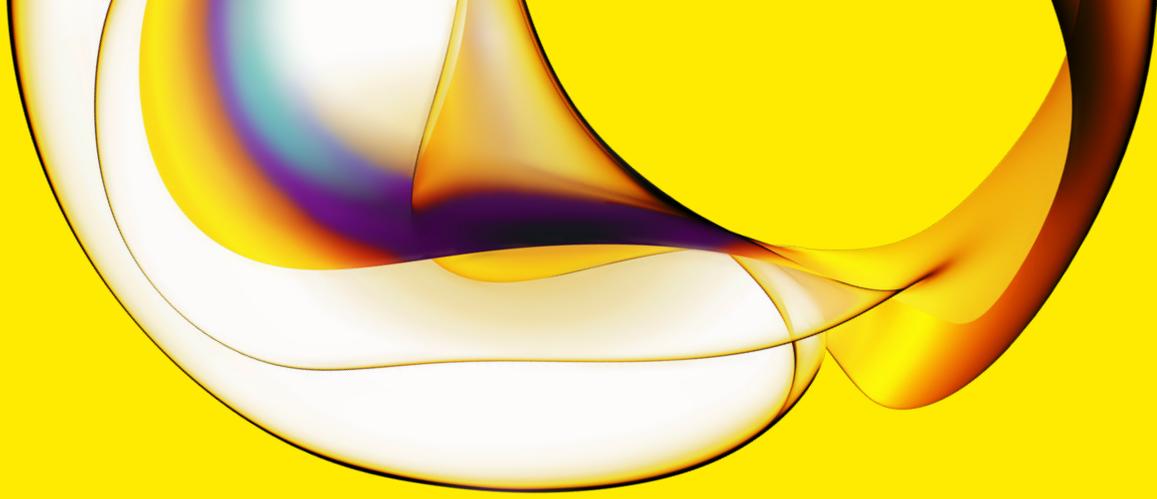
Inspect critical components, and look for signs of wear including scratches, or effects of chemical exposure on the rotor.

Pay close attention to noise, vibration, shaking, or grinding and stop the unit immediately if this occurs.

Regularly clean the centrifuge with neutral cleaning solutions (alcohol or alcohol-based disinfectant) applied with a soft cloth to rotors and accessories. Daily cleaning should include the interior portion of the centrifuge, the rotor chamber, and surfaces with electronic components, such as touchscreens and keypads.

It is important to be aware of the different types of samples used with the centrifuge and any specific products or protocols necessary for cleaning spills.





[www.revivity.com](http://www.revivity.com)

revivity

**Revvity, Inc.**  
940 Winter Street, Waltham, MA 02451 USA  
(800) 762-4000 | [www.revivity.com](http://www.revivity.com)

**OMNI International**  
935 Cobb Place Blvd NW, Kennesaw, GA 30144 USA  
(800) 776-4431 | [www.omni-inc.com](http://www.omni-inc.com)

For a complete listing of our global offices, visit [www.revivity.com](http://www.revivity.com)  
Copyright ©2023, Revvity, Inc. All rights reserved.