



FOUR QUESTIONS TO GUIDE YOUR LABORATORY CENTRIFUGE SELECTION



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A centrifuge is an integral component of a laboratory and is critical to the success of analysis. However, choosing the correct centrifuge for a particular application can be a daunting task. Centrifuges are available in a wide range of sizes, capacities, and capabilities. Options range from mini-centrifuges that hold only a few small tubes and spin several thousand RPM, to high-capacity centrifuges holding up to 6 liters of samples, to ultracentrifuges that spin upwards of 100,000 RPM.

Additional features such as refrigeration, or the capability to be connected to a network, add another layer of complexity to the process of choosing the correct centrifuge.

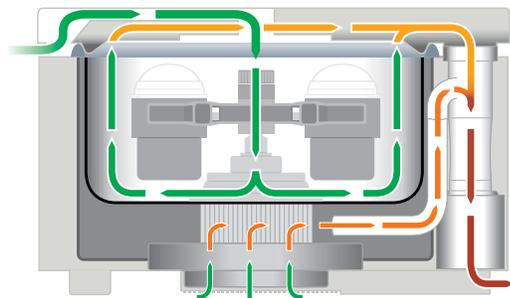
This Guide Offers Four Questions

When answered, these four questions can provide valuable guidance to successfully select a general purpose benchtop laboratory centrifuge.

Question 1:

Do Your Samples Need to Be Refrigerated?

There are two primary types of centrifuge, ventilated and refrigerated. A ventilated centrifuge draws air into the bowl and then exhausts that air out of the unit. This keeps the contents of the bowl slightly higher than the ambient temperature of the surrounding laboratory. During a typical 10-minute cycle, the temperature of a sample in a ventilated centrifuge will increase, however the increase is likely to be in the range of several degrees. For applications where precise temperature control is not critical, a ventilated centrifuge is a good option.



- Ambient Temperature Air
- Air Circulated Through Bowl
- Motor Cooling Air
- Exhaust Air

Ventilated Centrifuge Airflow

For applications that require precise temperature control, or a lower internal temperature during operation, selecting a



refrigerated centrifuge is a logical solution. Refrigerated centrifuges include a cooling system that lowers and maintains a preset temperature during operation.

Refrigerated Centrifuge

A ventilated system is not inferior to a refrigerated system; it is just not the best option in cases where temperature control is required. A refrigerated centrifuge is sealed, and is able to operate at higher RPM due to the ability to mitigate the heat generated by higher rotation speeds. If temperature control is not required, a refrigerated centrifuge should not be selected due to its higher cost and larger footprint.

Question 2:

What Are Your Speed Requirements?

A refrigerated centrifuge is capable of higher speeds than a ventilated centrifuge. However, the maximum speed a centrifuge can achieve might be substantially higher than is necessary for a given laboratory's needs. As speed increases, denser materials move further away from the rotational axis and lighter materials move closer. The speed that is required for your particular application is not only more important than the maximum speed of a centrifuge, it is essential in some areas, such as separating plasma from red blood cells.



4 Questions To Guide Your Laboratory Centrifuge Selection

In addition to an optimal speed range, a centrifuge should also be capable of utilizing rotors appropriate to applications within that speed range.

Rotors support sample tubes during operation of the centrifuge. The two primary types of rotors are swinging bucket rotors and angular rotors. A **swinging bucket rotor** uses buckets to contain sample tubes. The buckets spin at an angle increasing toward perpendicular to the rotational axis under centripetal force as the rotor speed increases. Swinging bucket rotors are ideal for low-speed, high capacity applications.



Swinging Bucket Rotor

With a **fixed angle rotor**, sample tubes are held at a constant angle, usually 45 degrees, throughout operation. This type of rotor can spin as much as three to four times faster than a swinging bucket rotor that is spinning the same tubes. The rotor you select is dependent on what you are spinning and how fast it needs to be spun.



Fixed Angle Rotor

Question 3:

What size tubes are you using?

The capacity needed for your centrifuge is also a crucial consideration, as there are a fixed number of sample tubes a centrifuge can hold during a run. Knowing how many tubes need to spin at one time, and of what size, aids in centrifuge selection decisions. For example, an angled rotor is specific to a particular size tube. An angular rotor intended for 50 mL tubes can only be used with tubes of that size. The need to spin 15 mL tubes in the same centrifuge requires a separate rotor. Whereas with a swinging bucket rotor, there are inserts inside of the buckets that can accommodate many different sized tubes. Swinging bucket rotors can also offer increased capacity. An angular rotor for 50mL tubes might hold eight tubes, while a bucket rotor can hold 20 tubes of the same size.

Also, inserts or rotors are designed for use with either conical, round, or flat-bottom tubes only. It is imperative to use only correctly shaped tubes for the insert or rotor you select, so the tubes and samples are properly supported. An incorrectly shaped tube can be crushed by centrifugal force during operation.



▲ Conical tubes must only be used in an insert designed for conical tubes.

Question 4:

Do you have size limitations for your centrifuge?

Bench space is always at a premium, so the dimensions of a centrifuge should be considered. The smallest centrifuges are used on the bench only. Some mid-sized centrifuges can be used on either the bench or the floor. The largest centrifuges are generally too large for a bench, and are floor-mounted only.

Floor-mounted centrifuges are typically smaller in length and width than bench-top centrifuges, but taller. Bench-top centrifuges are often larger in length and width than a floor-mounted centrifuge, but are shorter. Refrigerated centrifuges are larger than the equivalent ventilated centrifuge, and additional space is required for ventilation around the unit.



Consider available bench or floor space when selecting a centrifuge.



Summary

Overall, careful consideration must be made when selecting a centrifuge that best suits your application. While the factors above are critically important, many other factors, such as features, warranty, and of course price, play a role in which centrifuge to buy.

Ease of use is also a factor that should be considered. Any user, regardless of their laboratory experience, should be able to operate whatever centrifuge you select with a level of ease that allows for completion of tasks without risk to the samples. Since many of the protocols repeated by technicians will be developed by a lab manager or researcher, centrifuges with programming ability that allow technicians to execute a run with the push of a button can help mitigate risk. Once you have chosen your centrifuge provider, you should be able to provide them with a list of all of your specifications and then rely on their expert guidance to make your selection.

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