

Management

BULLETIN

Purchasing A Centrifuge

The centrifuge is the workhorse of the clinical laboratory. It is an essential piece of equipment that is often used by both laboratory and non-laboratory staff. So when it comes time to replace an old one or there is a need to add an additional one, it is important to purchase a centrifuge that both fits the needs of your laboratory and is easy to operate by all. An internet search will result in an overwhelming selection of different types of centrifuges. Each type is designed for a very specific purpose or for a specific specimen type. This article is a guide to help you decide how to purchase the right centrifuge for your clinical laboratory.

Below are eight basic questions that you will need to ask before purchasing a new centrifuge:

1. What size of centrifuge do I need?
2. What type of centrifuge is best for my laboratory?
3. What is G-Force/RCF and RPM?
4. What are the different types of rotors and which type do I need?
5. What safety features do I need to look for?
6. What additional features or options do I need?
7. What type of warranty and repair plan does the company offer?
8. What type of maintenance is required?

What size of centrifuge do I need?

This will be determined by how many samples you are processing daily, how much space you have and your available budget.

Floor model centrifuges are often used in laboratories that process large volumes of samples. Floor model platforms include ultracentrifuges, superspeed centrifuges and low-speed centrifuges. This type of centrifuge allows you to free up counter space; however, they are very costly.

Benchtop centrifuges are the most versatile and can be designed to meet a wide range of needs. Benchtop platforms include microcentrifuges, ultracentrifuges, and standard centrifuges. The one disadvantage is they take up counter space; however, they come in many different sizes, have varying specimen capacity and are budget friendly.

Answer: For the average volume clinical laboratory, the benchtop centrifuge is usually the centrifuge of choice.

What type of centrifuge is best for my laboratory?

To determine what type of centrifuge your laboratory needs, assess the type of specimen samples you are routinely processing. Specimen type determines the rotational speed needed. The number of specimens processed daily, and specimen volume determine your centrifuge capacity.

Microcentrifuges are generally used to process small sample volumes from 0.2 ml to 2.0 ml. Their rotational speed is greater than 15,000 RPM with a G-force of >20,000 xg, and they usually have a very compact design.

Ultracentrifuges are very high-speed centrifuges used for advanced specimen processing in specialized laboratories. Their rotational speed can be as great as 150,000 RPMs with a G-Force of >1,048,000 xg.

Routine centrifuges are also referred to as standard, general purpose, multifunctional, universal, or clinical laboratory centrifuges. They are the most versatile centrifuges and can be used to process a wide range of sample volumes from 0.2 ml - 50 ml. They are the most common centrifuges found in the lab and are used to process routine urinalysis, blood, stool, etc. They have a rotational speed ranging from 1,000 to 24,000 rpm with varying G-Forces depending on size of rotor.

Answer: For most general clinical laboratories, the routine benchtop centrifuge is the centrifuge that offers the most versatility and is the most logical choice.

What is G-force/RCF and RPM?

This is a very important factor to consider when purchasing a centrifuge. The types of specimens you are processing require a specific G-force to be centrifuged. G-force and RPM are two terms used to describe centrifuge rotational speed.

G-force – Also referred to as Relative Centrifuge Force, RCF. This is the gravitational force applied on the sample for sedimentation.

RPM- Revolutions per minutes. This is simply how fast your samples are rotating around the axis of the centrifuge.

RPM and G-force calculation is dependent on the radius of the rotor. A larger rotor will have more G-force than a smaller rotor. For example, when you set your speed at 3500 RPM, a large rotor with a radius of 15 cm will produce a maximum G-force of 2,058 xg, while a small rotor with a radius of 5 cm will produce a maximum G-force of 686 xg.

Answer: Choose a centrifuge that has the G-force capability that you need to process your routine samples.

What are the different types of rotors and which type do I need?

The type of rotor you choose will depend on rotor capacity, the rotational speed that is required to process your specimens, and the type of specimens you are processing.

Fixed angle rotors are metal blocks with wells that incline at a 15-35-degree angle. The rotors are generally compact, making it easier to rotate them quickly. Most medium and high-speed centrifuges use this type of rotor.

Swing rotors allow tubes to change angle by swinging out. The tubes become horizontal when the centrifuge is operating. The main disadvantage of this type of rotor is it cannot reach high rotational speeds. This rotor type is mainly used for low-volume research.

Answer: For clinical laboratory specimens, the fixed angle rotor is generally used. When you are purchasing your new centrifuge, you will probably notice that most centrifuges come with multiple rotors that can be changed out. Do your research! Some models can be hard to change out requiring special tools and manual rotor selection in the software. Incorrect installation of the rotor can cause the rotor to become unstable and result in disaster. Look for models that do not require special tools to change out and have an automatic rotor detection system to ensure the centrifuge does not work beyond the speed limit of the rotor. Also, look to see if the rotor is corrosion free, resulting in a longer lifespan.

What safety features do I need to look for?

Since the centrifuge is often used by many different operators, it needs to have some basic safety features that will help protect all users. Injuries can result in possible exposure to infectious organisms or physical harm. Most centrifuges today come with basic safety features such as a safety lock lid and imbalance sensors that will automatically stop the centrifuge to prevent tube breakage. Another excellent safety feature to prevent sample release is sealed safety cups or sealed rotors with O-rings as secondary containment. These rotors can usually be removed, and samples opened in a biosafety cabinet.

Answer: Verify that the centrifuge has a safety lock lid which will prevent the operator from opening the lid while the centrifuge is in use. Also look for automatic rotor identification to ensure that the rotor is operating at its designated speed and imbalance detection, which will stop the motor if a tube imbalance occurs. Check to see if sealed safety cups and/or rotors are an option.

What additional features or options do I need?

Many manufacturers offer lots of different accessories and features on their centrifuges. The most important thing to remember is to keep it simple. Are you processing different types of specimens that require different speeds, times, and tube sizes? Then you will want to make sure the centrifuge you choose offers the option to change speed, time, and modify rotor tube size. Some other options and features to look for are acceleration speed, deceleration speed, noise level and if needed, refrigeration.

Answer: Choose a centrifuge that offers easy to program time and speed. Verify that it comes with multiple rotors and/or spacers for different tube sizes. Read the manufacture's information detailing acceleration/de-acceleration time and noise level.

What type of warranty and repair does the company offer?

Each company offers different types of warranties and repair plans. Do not be afraid to ask questions. For example, what does the warranty cover and do they offer an extended warranty? Most of the time companies offer warranties that will cover electrical and mechanical issues caused by manufacturer defects. If they offer an extended warranty, you will need to decide if it is cost effective to purchase. Ask if replacement parts are easily accessible and how repairs are performed. Companies will either send a service technician out or will have you ship it back to them to repair. If the centrifuge were to need repair, you do not want to be in a situation where you are waiting weeks or months for parts and repair.

Answer: Know the company's warranty and repair policy. Determine if parts are easily accessible and if repairs will be done in a reasonable time frame.



What type of maintenance is required?

Equipment maintenance is critical to prolong the lifespan of your equipment. Review the required maintenance. See what the company recommends for daily, monthly, and annual maintenance. Annual service needs to be performed by qualified technicians and will be an additional cost that you will need to add to your budget.

Answer: Review the required maintenance schedule recommended by the company and add the additional cost for annual service to the laboratory budget.

Now that you have answered all your questions, it is time to buy your new centrifuge. You may choose to purchase through your supply distributor, search the web and purchase online, or contact a centrifuge company directly. Contacting a company directly is often your best option. They will send a qualified sales representative onsite that can discuss your needs, answer any of your questions and help you to choose the best centrifuge for your laboratory.

The centrifuge is the laboratory's workhorse, an essential piece of laboratory equipment. Shop smart, research and compare to ensure that you purchase a centrifuge that is well made, safe, simple to use and produces quality samples. If you need information on various centrifuge dealers, contact your Regional Laboratory Consultant or the Lab Improvement Unit at the North Carolina State Laboratory of Public Health.

REFERENCES:

"Choosing the Right Centrifuge." American Laboratory, November/December

"Centrifuge Buyers Guide" Lab Manager, August 12, 2018, <https://www.labmanager.com/purchasing-guides/centrifuge-buyers-guide-1984>

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