Lab Centrifuge Purchasing Guide: GMI Certified Knowledge

Flawless separation of samples is key to producing stellar quantitative results in various applications including clinical biology, proteomics, biochemistry, nanotechnology, and life science. Critical to preparation and extraction of solids, gas, liquid, and other fluid samples in scientific laboratories and research facilities, selecting a lab centrifuge with the requirements and technical specifications suited for your application should be done with thorough research into the units available on the market. Whether for use in differential, isopycnic, or sucrose gradient centrifugation, it is imperative to work with high-performance centrifuges that can guarantee the safety of your valuable assets.

GMI has prepared this simple guide to assist you in choosing the perfect centrifuge for your needs, saving you valuable time that you can spend on your real research - not market research.

Take Into Account Capacity & Size of Lab and Centrifuge

Before procuring a centrifuge, keep in mind the free space in your lab as this can define the instrument's accessibility and convenience of location inside your facility. If you have a spacious workroom, you can opt for floor-model centrifuges that can work on three, four, or more liters of multiple samples at once. However, if you have a modest workspace, you can get high-performance and easy-to-use benchtop models for your critical research instead.

Decide on and Allocate a Budget

Review your research and laboratory funding that is available to you for this purchase; If you are tight on your resources, you can consider one of the well-received options these days, getting used or fully restored to factory specifications centrifuges. Since most Original Equipment Manufacturers (OEMs) are subjected to tight schedules in supplying new lab machines, you might want to pick economical and quickly available reconditioned laboratory centrifuges for any urgent equipment needs or to meet market demands. Acquiring quality and certified pre-owned lab equipment from trusted and industry-leading distributors can save you up to 70% of your budget.

Evaluate Demands of Application Areas

With different kinds of lab centrifuges in the market, the first thing you need to do is assess what your application demands and then decide on the proper type of centrifuge to get.

Benchtop Centrifuges, also known as tabletop or general-purpose centrifuges, are the most common type available. Used for everyday sample preparation needs, clinical protocols, DNA/RNA research, and general purpose separations, this type of centrifuge is a standard and makes a very accessible utility for a range of applications.
For versatile benchtop centrifuges ideal for cell culture, plasma, and general purpose applications, you can always rely on GMI. We inventory a wide selection of used benchtop centrifuges offering basic and optimized user interface, complete with convenient analog controls and digital speed displays for quick and easy programming such as the Beckman Allegra 6 Series. For routine bench centrifugation, you can go for the IEC HN-SII and Beckman Avanti 30. If you require high-volume benchtop processing, you can opt for the Sorvall RT7 and Sorvall Super T21. If you have ample budget and are looking for new benchtop centrifuges, we offer a collection of top performance Hettich units including the MIKRO 185, EBA 280, Universal 320 and a lot more all for your clinical, research, and industrial applications.

High Speed Centrifuges are the best centrifuges to work with for shared laboratories with multiple users and a variety of processing requirements. Built to achieve super speeds while handling large sample sizes at high angular velocities, this type of centrifuge can collect microorganisms, cellular debris, cellular organelles as well as proteins precipitated by ammonium sulphate more quickly, making way for efficient research and workflow.

Leaning more to these super speed centrifuges? Get the fastest separations possible in the shortest amount of time while ensuring maximum user safety with ergonomic, new and used superspeed centrifuges available at GMI including the Beckman Avanti J-30, Sorvall RC6 and Hitachi Ultras CR22N.

High Capacity Centrifuges are more convenient and easier to use when working with bigger sample volumes as these can do batch processing. With enhanced capacity, these centrifuges improve productivity and performance when it comes to your purification and reproducible separation methods.

In need of multi-purpose, new and pre-owned high capacity centrifuges built for large-volume and daily-working lab facilities? GMI offers the Thermo Scientific Sorvall™ RC3BP Plus for low-speed separations, high-volume, and large-batch processing in biotech and pharmaceutical environments. You can also perform a range of operations for bioprocessing and blood laboratories with the Beckman J6 Series, Beckman J-20, Sorvall RC-3C Plus and the Shuke-LD-6M.

Microcentrifuges, also called as microfuges, are compact and more portable units usually used for micro volume applications like plasmid research, mini preparation kits, blood processing, as

well as DNA and RNA separation in medical, laboratory, commercial and educational environments.

Carry out simple or complex micro-volume protocols like mini preps for nucleic acid or protein lysate, spin columns, hematocrit capillaries with these maintenance-free used microcentrifuges in-stock at GMI: Beckman Microfuge 18 and Eppendorf 5402. We also distribute an excellent line of quiet, smooth-running, eco-friendly and new Hettich microfuges such as the MIKRO 200 and MIKRO 220 variants, offering extremely short run-up and down times for clinical laboratories and facilities for genetic research, virology, cytology and bacteriology.

Ultracentrifuges are designed to rotate samples at ultrahigh speeds that is much higher compared to conventional centrifuges, best for applications in molecular biology, biochemistry, and cell biology dealing with separation of small particles including viruses, proteins or protein complexes, and lipoproteins. These come in two types: analytical and preparative. Analytical ultracentrifuges can give relevant molecule information in samples like its overall shape, conformational changes, as well as the number and stoichiometry of subunits making up protein complexes. These feature scanning visible/ultra-violet-based optical detection systems that monitor a sample's progress during a spin in real-time. On the other hand, preparative centrifuges separate particles based on densities, isolating denser particles to be collected in the pellet and clearing suspensions containing particles.

Given the differences, think through your current and future studies including the type of information you want to generate from these. For experiments that deal with examination of mass and shape of macromolecules or protein complexes, you can go for analytical ultracentrifuges. If you will mostly need an ultracentrifuge for pelleting small particles like viruses, membranes, and organelles, or work on gradient separations, select preparative centrifuges like the Beckman L-100XP and Optima XPN-100 both included in GMI's portfolio of used ultracentrifuges. You may also want to check out new Hitachi ultracentrifuges including the CP90NX, CP100WX, and CS120FNX that we exclusively distribute.

Cytocentrifuges are used to deposit or retrieve cells and other microorganisms suspended in a liquid on microscopic slides, a function that ordinary routine centrifuges are not capable of performing. One of the key pieces in preparing a slide for cell staining in diagnostic and research laboratories, a cytocentrifuge is important for applications in Cytology, Microbiology, Hematology, and more.

For all your thin-layer cell preparations from any liquid matrix, you can always depend on GMI's array of cytocentrifuges designed to separate and deposit monolayer of cells on slides while ensuring cellular integrity like the Thermo Scientific Shandon CytoSpin 4. Win over your CSF, pap tests, bronchial secretions and pleura-pericardium fluids applications going with the Hettich CytoZen.

Check on Refrigeration Requirements

Some applications such as DNA, RNA, PCR or antibody analyses call for samples to be maintained in a refrigerated environment, with temperatures ranging as wide as -20C to -40C. If you are working on temperature-sensitive samples, you should get refrigerated centrifuges with cooling systems and automatic unit conversion capabilities as these can protect possible sample degradation brought about by heat from a centrifuge's spinning action.

Look at RPM and RCF Requirements

To meet optimal throughput in the lab, think of the RPM and RCF required by your current and future experiments. RPM stands for Revolutions Per Minute and tells how fast the centrifuge will go. RCF stands for Relative Centrifugal Force that is measured in force x gravity, also known as the g-force. It is the force applied to the contents of the centrifuge rotor. Because different applications call for different amounts of force, it is best to research on which one is the best suited for you. Doing this avoids wasted funds on a unit with higher or lower RCF than what you actually need.

Calculate the RCF (G-force) with this equation:
RCF = 1.12 x r x $(RPM/1000)^2$

Calculate the RPM with this equation:
RPM = $\sqrt{RCF/r\ x\ 1.12}$ x 1,000

Where r = centrifugal radius in millimeters (mm) = the distance from the center of the turning axis to the bottom of the centrifuge

Finding the right centrifuge to meet RPM and RCF demands of your application can significantly improve your laboratory efficiency and productivity. Get the most fitting unit for your experiment by checking out GMI's collection of centrifuges with rotational speeds starting at 3,000 RPM and RCF of up to 1,000,000 x g.

Consider the Type of Rotor Needed for Centrifuge Capacity Purposes

There are a variety of rotor types available in the market but the two main types for lab centrifugation are the swinging bucket (horizontal) and the fixed angle (angle head) rotors. Most of these rotors feature openings where sample tubes of a particular size or volume can be placed. Thus, a centrifuge's rotor type design can also be an indicator of how much samples the

equipment can hold and process, also implying the possible number of throughputs the unit can generate.

With a swinging bucket rotor design, samples initially swing out in a vertical position and then to a horizontal position as the rotor accelerates, making the tubes perpendicularly aligned to the axis of rotation and parallel to the applied centrifugal field during centrifugation. This rotor type makes way for pellets to neatly collect at the bottom of the sample tubes and is practical when samples are to be resolved in density gradients.

Alternatively, fixed angle rotors hold sample tubes at an angle to the axis of rotation. Since the bottom of tubes are not aligned with the direction of the centrifugal force, separations or particles collect along the side of the tube and into a pellet at the bottom, depending on the fixed angle set. The angle varies with different rotors, 25° and 40° being the common ones used. Fixed angle rotors are useful for isopycnic separations of macromolecules, protein precipitates, urinary crystals as well as for pelleting bacteria, yeast, and other mammalian cells.

Through these rotor types, various centrifuge models offer multiple combinations of capacity and maximum RCF attainable. These designs also determine the range of sample holders -- from microtubes, conical tubes to larger containers like blood bags or bottles and microplates -- that the centrifuge can work with. For maximum throughputs, you can also consider getting centrifuges with interchangeable rotors. Get the rotor type you specifically need by checking GMI's range of new and used centrifuge rotors available.

Consider Type, Size, and Number of Samples

Take into account the consumables for your equipment. Look at the size and number of samples involved in your study as these will determine the following items to get for your centrifuge:

- Type of sample tubes
- Size of sample tubes
- Type of centrifuge rotor

Here are some questions that you can also answer to ensure the application suitability of your centrifuge:

- What type of tube(s) will you be using, conical or round-bottom?
- What size tubes (mm & ml) will you be using? To get the most of your centrifuge, be sure to know the size and number of your samples as well as the size of the tubes you are planning to use for these.

- What is your sample type and what is your sample tube made of? Be sure you are getting the appropriate centrifuge by reviewing the samples you will be using it for as well as the materials of your sample containers, if these are made from glass, cellulose, esters, polycarbonate, polypropylene, nylon, stainless steel, etc.

  Glass centrifuge tubes are good for most solvents but tend to be more pricey. These are best for centrifugation at low speeds because they tend to disintegrate at higher centrifugal fields. Plastic centrifuge tubes are less expensive compared to the glass ones but be sure to check on its clarity, chemical resistance properties, sealing mechanisms and the requirements of the application you will be using it for. Thin-walled tubes can be used for horizontal rotors as these are protected by the surrounding bucket while thick-walled ones can be used for fixed angle rotors.

For a portfolio of centrifuges catering to various sample types as well as sample tube types, sizes, and materials, you can always depend on GMI. Browse our extensive catalog of new and used lab centrifuges for applications in cellular and molecular biology, biochemistry, medicine, and more.

The perfect centrifuge will be the one that best serves your application and laboratory needs. Following these key guides can help you find the most apt unit for your workroom, saving you not only budget but also work time and consumables in the long run. If you are having trouble choosing the appropriate instrument for your specific applications, you can always rely on effective solutions and advice from industry experts like GMI.

GMI has been providing highly advanced products and superior services to the scientific market and cost conscious laboratories for 20 years. With an ISO 9001:2008 certification under our wings, you can guarantee that any instrument purchased from us has passed through a meticulous refurbishing, recalibration, recertification, and testing process. We also offer various warranty, rental, and leasing options as well as service agreements for our products.

For any assistance needed on potential new or used lab centrifuge purchase, feel free to reach us at **1-888-702-1775** or email us at sschommer@gmi-inc.com today.