

OHAUS[®]

HEATING AND STIRRING BASICS

Navigating Hotplate Stirrer Equipment Selection



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Introduction

Heating and stirring equipment are ubiquitous in modern-day laboratories, essential for a range of applications across chemistry, biology, and biochemistry, including sample preparation, titration, chemical synthesis, and microbiological culture. Hot plates are heating devices with adjustable temperature control that can maintain a specific temperature to heat containers or vessels. Stirrers are employed to agitate and mix substances in vessels, ensuring uniform distribution. Magnetic stirrers use a rotating magnetic field to induce rotation in a stir bar placed within the liquid, while overhead stirrers use a motor-driven shaft and impeller to stir larger volumes or more viscous liquids.

Hotplate stirrers offer dual functionality, combining variable speed spinning with simultaneous liquid heating. These workhorse devices are one of the most used tools in the laboratory and while their basic functions are standard, there are unique features and capabilities across devices that may be better suited for the specific needs of your laboratory. Advancements in digital technology have also led to the development of smart features that enable flexible programming of multiple parameters like target temperature as well as remote monitoring and control capabilities.

OHAUS Corporation is a leading manufacturer of laboratory equipment, known for their accuracy, reliability, and durability. OHAUS' [Guardian™ Series](#) of hotplate stirrers offer superior performance, safety, and simplicity, making them a mainstay in labs worldwide. The choice of hotplate stirrers depends on the specific requirements of your lab and considering factors such as the volume and type of samples you work with, performance, safety features, and ease of use, are important to achieve consistent and reliable results.



GUARDIAN™7000



GUARDIAN™5000



GUARDIAN™3000



GUARDIAN™2000

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Considerations for Hotplate Stirrer Selection

1. Capacity/Volume

When selecting a hotplate stirrer, one of the critical factors to consider is the capacity or volume to be stirred. Hotplate stirrers are available in various sizes with different top plate dimensions and stirring capacities to accommodate different vessel sizes and sample volumes. It's essential to choose a hotplate stirrer with a top plate that matches the size of your vessels. Using a plate that is too large may lead to inefficient heating and energy wastage, while a plate that is too small may limit the number of vessels you can heat simultaneously. Additionally, consider the stirring capacity of the hot plate stirrer, including the maximum stirring volume and speed, to ensure it meets the specific requirements of your experiments.

OHAUS' Guardian™ Series of hotplate stirrers are designed with versatility in mind, capable of mixing up to 20L and accommodating stirring speeds ranging from 60 to 1600 rpm, making them suitable for a wide range of laboratory applications. For larger volumes, OHAUS also offers four large volume stirrer models suitable for volumes between 25 to 200L. Featuring a broad top plate surface, these stirrers are driven by a powerful motor and strong magnet to ensure secure magnetic coupling to enable the processing of oversized vessels such as carboys and their powerful magnetic drive ensures effective mixing of highly viscous materials (e.g., Model STLC2DG used with the stir bar provided can stir 70L of 65 mPas canola oil at speeds of up to 1800 rpm).



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2. Accuracy and Precision

Accuracy and precision are important factors for many applications, especially if you want to ensure repeatability or plan to scale up your process. Advanced digital hotplate stirrers include microprocessor technology for accuracy and precision with independent digital control of both heating and stirring. This digital control can provide stir rate and temperature adjustments of a tenth of a degree, and it maintains the stirring rate and temperature more accurately.

OHAUS Guardian™ Hotplate Stirrers are equipped with Smart™ performance features, aimed at modernizing and optimizing laboratory operations. The Single Point Calibration feature ensures accuracy and reliability on specific

temperature setpoints, enhancing the precision of temperature control and allowing users to calibrate the temperature to match a traceable external thermometer to meet GLP/GMP requirements. Exclusive to the Guardian 7000 series hotplate stirrer, the SmartRate™ software-controlled temperature ramp rate feature allows for precise temperature adjustments, while the programming feature enables the storage of up to 5 multi-step programs to support complex heating processes, offering unparalleled control and flexibility.



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3. Operating Range

You need to ensure that the temperature the hotplate stirrer can reach will be high enough for your application. The temperature range of a hotplate stirrer is determined by its top plate material, with options including ceramic, ceramic-coated steel, and aluminum—each offering unique benefits for specific applications.

Ceramic top plates are chemical-resistant, withstand temperatures up to 500°C, and are easy to clean. However, they may not provide uniform heating across the surface and are not suitable for use with sandbaths or metallic vessels that reflect heat. On the other hand, aluminum top plates offer excellent thermal conductivity, providing uniform heating but with a lower maximum temperature of up to 380 compared to ceramic. They are also durable and resistant to cracking or chipping.

Ceramic-coated steel top plates offer uniform temperature distribution but with a lower maximum temperature than ceramic. Each top plate material offers distinct advantages, allowing users to select the most suitable option based on their specific heating requirements and experimental needs.

Aluminum
Top Plate



Resin
Top Plate



Ceramic
Top Plate



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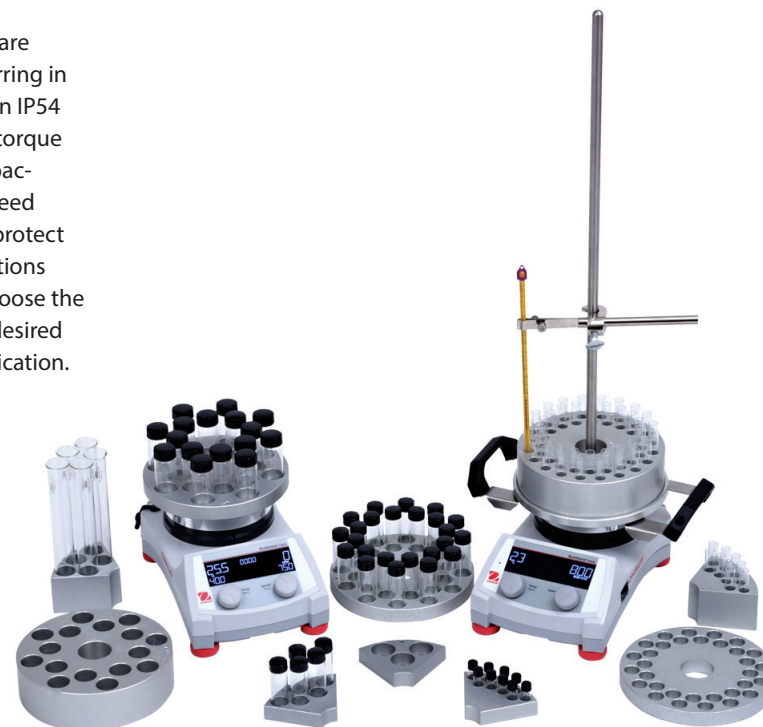


4. Application

The choice of equipment is also influenced by the viscosity of the fluid being stirred. Magnetic stirrers are best for less viscous samples, but as sample volume or viscosity increases, an overhead stirrer should be considered. They are well-suited for handling larger volumes or highly viscous liquids, particularly in applications requiring high stirring speeds and torque. If heating is also required, the overhead stirrers can be coupled with a hot plate.

The OHAUS [Achiever™ 5000 Overhead Stirrers](#) are specifically designed for powerful and precise stirring in demanding applications. The sealed design has an IP54 rating and the series includes five models with a torque range of 20-200 Ncm and up to 100 L volume capacity. The keyless chuck and software-controlled speed ramping provide easy set up and safe stirring to protect the sample and user. With eight agitator shaft options available, users can use the [Selector Guide](#) to choose the stirrer and shaft combination that produces the desired flow motion within the sample for a specific application.

For biochemistry and chemistry labs that routinely carry out complex heating and stirring applications, the OHAUS Guardian™ round top models can increase productivity without the need for a larger plate surface, saving valuable bench space. These models accept a wide range of aluminum block accessories that can accommodate standard vials and test tubes, allowing researchers to use multiple positions to perform experiments in parallel.



Guardian™ Series Accessories

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5. Safety

Safety is paramount in laboratory settings, especially when dealing with heating equipment. Unit failure can lead to failed experiments, laboratory damage, or even personal injury. Such accidents can be avoided by selecting the hotplate stirrers that have built-in safety features. OHAUS Guardian™ Series are equipped with advanced safety features, including a prominent 13 mm Hot Top Indicator Light that remains illuminated to alert users of a hot surface even when switched off.

The Guardian 3000, 5000, and 7000 Series heating models feature **SafetyHeat™**, an industry-leading overheat protection system that utilizes two independent safety controls to monitor the electronics and prevent overtemperature conditions. The Guardian 5000/7000 Series models feature

SmartHousing™, designed to remain cool to the touch across all temperature settings. Exclusive to the Guardian 7000 Series, **SmartPresence™** and **SmartLink™** technologies further enhance safety by automatically shutting off the heater if no one is detected by an infrared proximity sensor after a user-defined "time out" period has elapsed or if the Bluetooth® link paired to a mobile device is disrupted.



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Final Remarks

As laboratories continue to evolve and advance, the importance of reliable and versatile heating and stirring equipment cannot be overstated. OHAUS' commitment to safety, affordability, and durability is evident in their Guardian Series of hotplate stirrers. By offering superior performance, innovative features, and advanced safety mechanisms, OHAUS ensures that researchers can conduct experiments with confidence and achieve consistent, reliable results.

Whether you're working with small volumes in a chemistry laboratory or handling large-scale experiments in a biochemistry setting, OHAUS offers a comprehensive range of hotplate stirrers designed to meet the diverse needs and budgets of modern laboratories worldwide.



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