

BATHS FOR SCIENCE

Water baths, oil baths, and immersion devices are used widely across applications.

BUT ARE ALL BATHS CREATED EQUAL?

We'll show you why you might need something different.



SINCE 1889





INTRODUCTION

Water baths, immersion devices and coolers, and oil baths are all used to heat or cool samples or to keep them at a constant temperature. Your options are vast when it comes to laboratory baths.

In this guide, we're going to help you identify the features you need in your application, so you don't waste precious budget on features you'll never use. We'll cover the three main types:

- Water baths
- Oil baths
- Immersion devices and coolers

We'll walk you through temperature ranges and specialized features, and give you an outline of general questions to ask when you're talking to a manufacturer or distributor.

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LABORATORY WATER BATHS

Laboratory water baths are primarily used to heat or maintain the conditions of samples in a laboratory. A water bath generally consists of

- A stainless steel chamber filled with water in which the sample container is immersed
- A heating element
- An interface used to control the device.

Water baths are used for all kinds of applications, like carrying out reactions at specific temperatures in biology labs, heating flammable chemicals, warming up solutions before injection, and sometimes preparing reagents.

LABORATORY WATER BATHS

TEMPERATURE RANGES



The type of bath you choose depends on the temperature conditions your laboratory applications require. There are four common temperature ranges on the market:

- General
- Standard
- Precision
- Low temperature.

Each temperature type varies based on their maximum operating temperature, which is the highest temperature the device can safely and efficiently operate at, and their temperature adjustment accuracy, which is the validity of the set temperature versus the actual temperature of the water. When shopping for a water bath, look for a versatile temperature range between room temperature +5°C and 99.9°C. Above 99.9°C, an oil bath or alternative is required.



THERE ARE SO MANY DIFFERENT TYPES OF WATER BATHS OUT THERE. WHICH IS THE BEST FOR MY LABORATORY?

You have a lot of options to work with, each built around a core set of features. Let's boil it down:

COMPACT DESIGN CONSTANT TEMPERATURE WATER BATHS

Compact Design Constant Temperature Water Baths are exactly what they sound like. They have a water capacity of 4-7 liters, making them ideal for small spaces and easy to store. They are generally non-circulating - meaning the water is still in the bath. Heat is transferred by convection, which is less efficient than by circulation (like the precision baths below). However, the compact design of these space-saving benchtop systems means heating doesn't take as long as larger convection-heated baths. Depending on the size and the model of the compact water bath you choose to buy, there are a few great features we recommend keeping an eye out for:

- Removable water tanks to easily change the water
- A thermometer to accurately detect the actual temperature of the water
- Integrated protection around the water tank to protect operators from heat and burns



[Yamato's BM Series compact constant temperature water bath](#) is available in 4L, 5L and 7L.

Yamato also offers [BS Series with a maximum temperature of water's boiling point](#). It can accommodate several different sizes of containers as internal capacity ranges from 4.7L to 14L.

The BS Series is also an energy-saving model. They're heated by convection to create a low power draw, and they're used in long-term research applications.

The larger a bath gets, the more power-hungry it gets. For energy efficiency, we recommend nothing larger than 15L, and the BS series fits into that. Beyond 15L, efficiency returns begin to drop off. Some useful features to look out for include:

- Overheat prevention
- An electric leakage breaker to protect the operator and the sample from shocks
- Fitted accessory baskets for multiple flasks

PRECISION CONSTANT TEMPERATURE WATER BATHS

Precision Constant Temperature Water Baths are also often called circulating water baths. They accurately maintain a set temperature due to the transport of heat as water circulates. They are ideal for applications that require a high degree of temperature accuracy, such as needing to maintain temperature uniformity in enzymes and serological applications. They are usually used for large capacity operations where convection isn't practical. Some features to consider include:

- A glass observation window and an optional removable lid to allow the operator to visually monitor the sample and maintain temperature accuracy
- Digital display indicating changes in temperature
- A high-precision thermostat to achieve highly accurate temperatures

YAMATO'S BK SERIES



[Yamato's BK Series](#) designed with an observation window operates at fixed temperature and is available in 27L to 144L tank capacity.

PROGRAMMABLE PRECISION CONSTANT TEMPERATURE WATER BATHS

Programmable Precision Constant Temperature Water Baths operators can be freed up during more involved processes with programmable water baths. The programmability of this type of water bath makes them suitable for applications that require a wide temperature range and a high degree of accuracy, such as pharmaceutical and medical research. Their programmability also makes them ideal for long-term procedures, like maintaining the condition of a sample until it's ready for use. Programmable baths are almost always circulating baths, because of the precision this type of heating offers. To optimize the performance of a programmable water bath, look for the following features:

- Communication capabilities with other devices
- Multiple flow patterns of circulation
- High temperature accuracy (it's not uncommon to see accuracy of $\pm 0.01^{\circ}\text{C}$)



BH AND BA SERIES



[BH](#) and [BA Series](#) are Yamato's programmable precision water baths. They have an extremely high degree of temperature adjustment accuracy due to a high precision thermostat and circulation pump. BH Series is at $\pm 0.01^{\circ}\text{C}$ while BA is at $\pm 0.02 \sim \pm 0.07^{\circ}\text{C}$. Its program operation allows a combination of temperatures, times and modes as one operation.

CONSTANT LOW-TEMPERATURE WATER BATHS

Constant Low-Temperature Water Baths maintain the set temperature of samples at an operating temperature range of around -10~80°C using circulation. Low-temperature water baths are sometimes used to remove heat from samples or to bring them back to room temperature. A few things to look for when purchasing a constant low-temperature water bath are:

- Large tank space, making these baths versatile and useful in multiple applications
- Adjustable shelf height to accommodate different flask sizes
- Safety features that relate specifically to your application

BBL SERIES

BBL Series (available in 8L and 13L) operates at a wider temperature range of -10~80°C with temperature accuracy of $\pm 0.01^\circ\text{C}$.



LABORATORY OIL BATHS

Laboratory oil baths are primarily used to heat samples that need to achieve a higher temperature than water baths are capable of. They generally use the same mechanisms (convection, circulation), but come at a higher price point. They're also resistant to microbes that may be present in water baths, and don't lose liquid to evaporation the way water baths do.

LABORATORY OIL BATHS

TEMPERATURE RANGES



Operating temperature ranges are wider than water baths, with some instruments working in the range of +10~180°C, and some units (depending on the type of oil) capable of operating over 270°C.



I'M FINDING A LOT OF OIL BATH OPTIONS ONLINE. HOW DO I KNOW WHICH ONE WILL WORK BEST FOR ME?

Temperature range and size are primary concerns for most users.

COMPACT CONSTANT TEMPERATURE LABORATORY OIL BATH

A Compact Constant Temperature Laboratory Oil Bath is a smaller unit with a tank capacity of 5-7 liters, suitable for small-scale heating reactions in research facilities. Compact benchtop units won't reach temperatures as high as larger capacity oil baths. They sacrifice some power in favor of that small footprint. Even these smaller units can achieve high temperatures in the range of 180°C or greater. Some features to look out for include:

- Digital control and display of temperature settings
- A removable oil tank for easy cleaning or changing oil type
- Safety covers or sheets to protect operators in small spaces

YAMATO BO SERIES



[Yamato BO Series](#) is available in 4L, 5L, and 7L capacity with maximum operating temperature of either 180°C or 199°C, depending on chosen model.

LARGE CAPACITY CONSTANT TEMPERATURE LABORATORY OIL BATHS

Large Capacity Constant Temperature Laboratory Oil Baths are as straightforward as they sound. Built for large-scale operations, these often feature abundant safety features. Working with the extreme temperatures these large instruments can achieve (270°C or higher!) can be hazardous. A clean workspace, safety gear, and training are important for all operators. Some features to keep an eye out for are:

- Jet stirring to achieve even high-temperature distribution
- Redundant overheating safeties (some units have three or more)
- Max temperature heating time of two hours or less



YAMATO'S BOA SERIES

[Yamato's BOA Series](#) is equipped with 3 overheating preventors and a tank capacity of 37L.





IMMERSION TEMPERATURE DEVICES AND COOLERS

Immersion temperature devices and coolers differ from water and oil baths in one huge way: instead of immersing the sample within a water or oil bath, immersion devices and coolers are placed in a basin which is filled with water or oil, and the sample is placed in the basin when the required temperature is reached. Their applications are quite different too. Sometimes, immersion devices and coolers are used to readjust the temperature of a small quantity of a previously heated or cooled sample.



I USED THESE BEFORE BUT NEVER BOUGHT ONE FOR MY LAB. WHAT SHOULD I BE LOOKING FOR WHEN I'M SHOPPING?

TEMPERATURE RANGES

Immersion constant temperature devices run at a maximum operating temperature of 200°C, whereas immersion coolers run at a lowest operating temperature of -20°C. Though they have a wide temperature range, immersion devices and coolers are not meant for large capacity samples.

IMMERSION CONSTANT TEMPERATURE DEVICE

Immersion Constant Temperature Device is a thermostatic device that maintains a constant set temperature when immersed in water. To capture the best performance possible, look for the following features when shopping:

- Adjustable water jet strength patterns to control the vigor of the procedure
- Models that can be used in both water and oil immersion
- Temperature preset function to enable memory on the device

YAMATO'S BF SERIES



[Yamato's BF Series](#) has optional testing bath with capacities ranging from 8L to 27L, although it can also be used with other baths such as Yamato's BW400 shaking bath. Stirring mechanism can either be water jet stirring or propeller stirring. Model BF600 can use water or silicon oil as medium.

IMMERSION COOLERS (NEOCOOL DIP)


Immersion Coolers (Neocool Dip) are meant to be used in combination with a water bath. When immersed into a water bath, the immersion cooler immediately cools fluid using its dipping coil. Some features to look for when on the market for an immersion cooler are:

- Spiral tubing made out of chrome-plated copper to resist corrosion
- Flexible cooling coil to allow for easy immersion in various sample types
- Carrying handles for safe and ergonomic use

YAMATO'S BE SERIES



[Yamato's BE Series](#) cooling coils are made of either chrome-plated copper or SUS304 stainless steel, for high resistance corrosion.

A photograph of laboratory glassware. In the foreground, a clear Erlenmeyer flask contains a yellow liquid and a white magnetic stir bar. Behind it, a graduated cylinder and another flask, also containing yellow liquid, are visible but out of focus. The background is a plain, light-colored surface.

GENERAL FEATURES FOR BATHS AND RELATED INSTRUMENTS

Aside from the specialized features of each type of bath, there are some general features you should always aim for. Below, we've prepared a list of questions you should ask when you're searching for a laboratory bath:

- Does the unit have decontamination features like removable tanks or built-in drains?
- How easy-to-use are the controls? And are they analog or digital?
- Does the unit allow for optional accessories? (For instance, a water bath with the option to add a cooling unit)
- How easy is it to maintain the equipment? Are the materials prone to corrosion?



GREAT, YOU KNOW EVERYTHING YOU NEED TO KNOW. BUT HOW DO YOU NARROW IT DOWN?

Lay out your workflow on paper, record the most important features from this buying guide, and spend some time talking to manufacturers about your application. Baths are often used across applications within the same workplace (in colleges and universities in particular), so you may be able to split the cost with other departments by expanding a few of the features your department might not need, but theirs does.

Spend a little time looking around. There are great deals to be had from overseas manufacturers making high quality baths that don't get the same markup you find from the more familiar names in the industry.

With over 130 years of experience in the industry, Yamato Scientific America is well-equipped when it comes to providing superior services and state-of-the-art products for the scientific market. All products are manufactured in compliance with stringent quality standards and international regulatory requirements.

Whether you are ready to make a purchase or still need to do more research, Yamato Scientific America is here to help. Contact us at 1-800-292-6286 or reach us at customerservice@yamato-usa.com.