

# Constant temperature ice bath



- Lower uncertainty zero-point (to  $\pm 0.002$  °C uniformity)
- Affordable—amazing price for this uniformity and stability
- Many probes can be checked/calibrated at once

Take a look at this easy and affordable zero-point source for calibrating temperature sensors—the Hart Scientific 7911A2 Constant Temperature Ice Bath.

Now you can attain lower uncertainties from a simple ice bath. Most people don't realize just how much uncertainty a stationary ice mixture in a typical ice bath can have. Pockets of non-uniform temperature will wreak havoc on your calibration uncertainties. With a stirred ice bath, the uniformity and stability can easily drop to  $\pm 0.002$  °C. Now that's more like it!

The 7911A2 has a 5-liter tank with a depth of 12 inches. This gives you an optimal calibration zone of 2.5" diameter by 8" deep—enough space to calibrate several probes at once, including odd-shaped or short probes. Think how many thermocouple cold junctions you could put in this bath!

As with all Hart products, the model 7911A2 Constant Temperature Ice Bath is manufactured according to a proven design using the best components.

The vacuum-insulated stainless steel dewar is used to give your ice-point realization longevity (a well-prepared ice bath can be used for several hours without attention).

We use a Rosemount-designed "flow chute" stirring mechanism to saturate the bath water with air as it stirs. Having the same concentration of air in the mixture each time increases the repeatability of the ice point.

Using pure distilled or demineralized water for bath fluid and ice, you'll consistently produce a 0 °C calibration environment with up to  $\pm 0.002$  °C accuracy.

For thermometer calibrations or for a thermocouple cold junction temperature source, if you want the best ice bath results, use the best equipment available—get the Hart 7911A2.

## Specifications

Uniformity	$\pm 0.002$ °C†
Stability	$\pm 0.002$ °C†
Optimal Temp. Zone	64 mm dia. x 203 mm D (2.5 x 8 in)
Size	185 mm dia. x 490 mm D (7 x 19 in)
Tank Capacity	5 Liters, 150 mm dia. x 300 mm D (6 x 12 in)
Weight	13.5 lb (6.1 kg)
Power	115 V ac ( $\pm 10$ %), 60 Hz, 1 A or 230 V ac ( $\pm 10$ %), 50 Hz, 0.5 A

†based on a properly made ice bath mixture

## Ordering Information

7911A2 Constant Temperature Ice Bath

## Preparing an ice bath

You wouldn't think that making a good, repeatable ice bath would be a difficult thing. Well, it's not if you follow some simple procedures, which you can find in the ASTM Standard Practice E563. Those are too detailed to cite here, but here are some quick thoughts:

- By always following the same procedure and using the same source for both water and ice, you'll improve the repeatability of the temperature you achieve.
- Remember that any impurities in the ice and water you use will affect the ice bath temperature. Pure distilled, demineralized, or deionized water is recommended for realizing the true ice point temperature, 0 °C.
- Be sure to keep your bath container clean by rinsing it with pure water.

## Avoid water problems in cold baths

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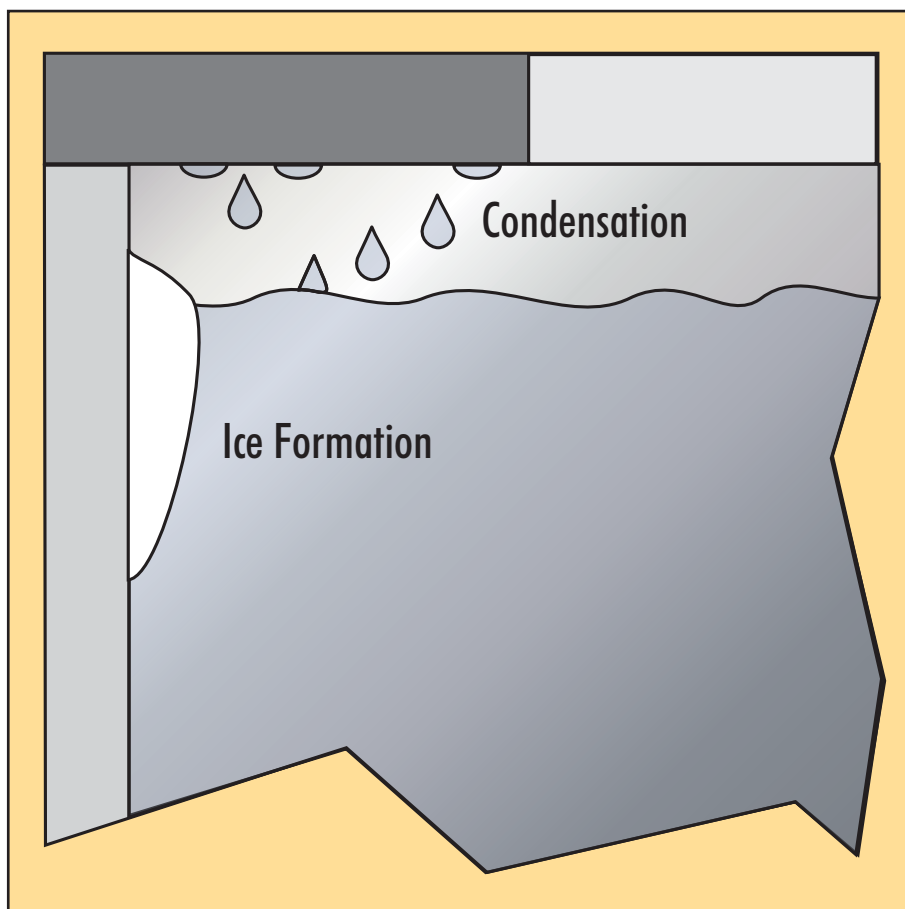
Halocarbon, methanol, ethanol, silicone oils, ethylene glycol, and Fluorinert are common bath fluids used at cold temperatures. Under ideal conditions, they make excellent heat transfer fluids for calibrations. But how are their heat transfer characteristics affected by water and how does this occur?

When a bath is operated at low temperatures, moisture condenses on exposed cold metal surfaces. This moisture accumulates until gravity causes it to run or drip into the bath fluid. Water may also be absorbed directly into the fluid from the surrounding air, particularly when ambient conditions are high in humidity.

Small amounts of water in most bath fluids will usually not affect the bath's performance in any noticeable way. However, as more water accumulates, the bath's performance will deteriorate. The water converts to small ice crystals, the viscosity of the fluid increases, and the result is a degradation in the stability and uniformity characteristics of the bath. Obviously, this is a bigger problem in areas with higher humidity.

Condensed moisture affects various fluids in different ways. For example, ethylene glycol (mixed in a 1:1 ratio with water) is the least affected by an increase in water content. Alcohols such as ethanol or methanol absorb water and have a high tolerance for moisture in the short term, but will exhibit poorer performance as water content continues to increase.

Silicone oils, on the other hand, do not absorb water at all, which can allow excessive water to freeze on exposed cold metal surfaces. When this occurs, the oil is somewhat protected, but a new problem arises when the ice formations act as a thermal barrier or insulator and the conductive characteristics of the bath's walls are compromised. This can result in a bath failing to reach its lowest rated temperatures and, in severe cases, can impede or even completely stop the stirring of the fluid.



So, what to do? Here are a few suggestions:

- Always keep the bath's access cover in place, especially when operating the bath below room temperature. The idea here is to prevent the wet room air from circulating throughout the tank area and depositing its moisture in the bath.
- If the bath is equipped with a rubber fill-hole stopper, a hole may be drilled through the stopper through which a metal tube can be inserted to supply dry air or nitrogen. The pressure

should be adjusted just enough to maintain a positive pressure flow.

- With oils, the water can be boiled off periodically at 100°C.
- Alcohols must simply be replaced when they become saturated with water.

Maintaining the bath fluid (by keeping it as dry and clean as possible) and following moisture prevention techniques will help ensure your bath keeps running at top performance.