

Recommended Sous-Vide cooking devices for WS-1400A controller

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During the development of the Sous-Vide (SV) controller, we evaluated many different types of cooking devices. We want to share our experiences with our customers so that you can achieve the best results and will not repeat our mistakes.

Best choices.

Option 1. Traditional style commercial rice cooker with mechanical switch.



We think this is the best choice for cooking SV. This type of cooker has very robust pot that will not be easily damaged. Since the heater is placed at the bottom, it forms a very good convection for uniform temperature distribution. The maximum temperature difference at the different sections of the pot is about 1 °C during heating up process and less than 0.2 °C once it is stabilized. The cooker has good insulation so that much less energy will be used than a circulation water bath. The cooker's mechanical switch can function as a safety switch for SV. It will shut off the power if the water is dried out. The price of this type of cooker is also very reasonable. It ranges between \$100-200. Among them, the Winco 25 cup and 30 cup cookers (model ERC-50 and ERC-60) are very good value. We have tested both models and received excellent results.

Note #1, "30 cup" is a measurement for the dry rice that can be cooked. The actual volume of the 30 cup cooker is about 12 liter when filled to the rim (~ 12 US quart). Since SV cooking needs large amount of water to surround the meal and the plastic package also takes space, a 6-12 quart cooker is good for family uses. The pot inside dimension for Winco 30 cup cooker is 6 inch deep and 13

inch in diameter (150 mm x 375 mm). This is larger in diameter and shallower in depth than that of the 33 Cup cooker mentioned below, more suitable for large size pack.

Note #2. We refer “Traditional style rice cooker” for rice cooker that has no insulation or heater on the metal cover. This type of cover has moderate heat loss that helps for the temperature control.

Option 2. Slow cooker and home rice cooker.



Slow cooker and home rice cooker provide very good value. The largest slow cooker on the market is about 7 quart, and the largest home rice cooker is for 10 cup of dry rice (equivalent to a 4 quart slow cooker pot size). You need to make sure to use the model with a simple dial for the slow cooker or press switch for the rice cooker (no digital display and membrane switch). They normally cost less than \$40. The rice cooker heats up fast and has better controllability because it has more power and heats from the bottom. A 10 cup rice cooker has 700 watts heater as compared to 400 watts heater on 7 quart slow cooker. Slow cooker heats from the side wall. The ceramic pot is slow in responding to the heater. It might take 2 hours to stabilize the temperature to within one degree. However, the slow cooker can hold a larger pack because the volume and oval shape (12” x 8.5” x 4.8” L x W x D). The 10 cup rice cooker can hold one pack of half chicken. The 7 quart slower cooker can hold two packs of half chicken. If you cook food that require less than 2 hours of cooking time, the rice cooker is a better choice. Use slow cooker if the food requires more that 2 hours of cooking time or size of pack is large.

Option 3. Stainless steel commercial rice cooker with mechanical switch.



This type of rice cooker has basically the same advantage as the one mentioned in option 1. In addition, the stainless steel finish is easy to clean and looks stylish. It is even more energy efficient because of extra insulation on the cover and wall. For the Winco 33 cup cooker (model ERC-66, filled with 9 liter of water), only ~ 40 watts are needed to maintain it at 60 °C (141 °F). However, the extra insulation made it difficult to control the temperature. If there is a temperature overshoot during the initial heat up process, it will take longer to recover. It will be difficult to cook food that only needs short period of cooking time unless it is operated with cover open to increase the heat loss. The price is higher than the “option 1”. This type of cooker normally has a thinner aluminum pot with TEFLON coating. The coating was for preventing the rice from sticking. It serves no purpose for SV application. The thin aluminum pot is more fragile than the pot used in option 1. Price range, \$150-\$300.

Devices that also work.

Tabletop Roaster



This is the cheapest solution for large meal Sous-Vide cooking. You can find the NESCO 18 Quart Roaster in Sears for \$50 when it is on sale. Some other brands can be as low as about \$40. However, there are several limitations. Since the roaster is heated from side instead of from bottom, the circulation of water is very limited. Hot water from the side wall tends to stay on top. It relies on the heat conduction (instead of convection) to get a uniform temperature. During heat up,

temperature difference between the top and bottom can be as much as 10 °C (18 °F). It will take about 50-60 minutes for the temperature to become uniform to within 1 °C from start. Although it might not be a problem for meal that needs to be cooked more than 2 hours, it is an issue for food that only needs less than an hour cooking time. You need to stir it once a while. In addition, the insulation of the roaster is not good. The outer surface can become very hot to touch during heat up. Since it is designed mostly for outdoor use, it is not engineered as nice as the rice cooker. When heating up, you can always smell the burning of chemicals even after a month of use.

Rice warmer. The pot size of commercial rice warmer can be twice as large as the commercial rice cooker. However, it only has very limited power, just enough to maintain the temperature. It can't heat the water up to the cooking temperature. You have to add hot water in to make it work. In addition, when cold food is added, the temperature recovery is very slow due to the limited power.

Devices that are not recommended

Hot plate or cook top.

The hot plate and cook top should not be controlled by this controller. One of the reasons is that some hot plate has no safety switch to prevent overheat. The cook top can become dangerous when controller fails or if the user forgot to put the sensor in the pot. The size of the pot can be another issue. With cook top, user might put a pot of any size. However, if the size is more than 12 liter, the controller will overheat with 120 VAC power source

Other than the safety concern, the performance is also less ideal. Hot plate is designed for heating pot that does not have insulated wall. The heat loss of the pot causes a larger temperature gradient between the bottom center of the pot and edges. Energy efficiency is also lower. For comparison, the WINCO ERC-60 rice cooker (shown in the first picture) filled with 9 qt of water (8,7liter) needs about 75 watt of power to maintain the temperature 40 °C (72 °F) above the ambient. When the inner pot of the rice cooker was put on a hot plate, about 150 watts of power is needed to maintain the same temperature difference. That is 0.75 kWh of extra electricity for 10 hours cooking.

Steamer that holds more 3 gallons of water

The controller should not be used for heating pot that contains more than 3 gallon (12 liter) of water unless it is preheated to the setting temperature. This limitation is due to heat produced inside the controller by the solid state relay during initial heat up. To make the controller compact size and splash proof for kitchen environment, the controller uses the top surface of the box to release the heat. That limits how much heat can be released. During the initial heating up, the controller is limited to run full power of 14 A for 30 minutes only. This is just enough energy to heat 12 liter (3 gallon) of water from 20 °C (68 °F) to 80 °C (176 °F). Longer time will cause the controller to overheat. It will not only damage the controller but also is dangerous. It should be noted that once the temperature

reaches the set temperature, the controller only outputs very limited power to maintain the temperature. Very little heat will be produced by the controller. Therefore, the only way to control the larger pot is to preheat the water without using the controller first.

For 220 VAC, user needs to check the current requirement. For the same wattage, the current will only be 55% of a 120 VAC operated device. The controller will not overheat if the current is less than 12 A.

Devices can't be used

Electronics controlled rice cooker and slow cooker.

This controller is designed to control the rice cooker and slow cooker with a mechanical switch. It can't control rice cookers or slow cookers that have electronics control system. If the device has a digital display, a membrane switch key pad, it most likely is electronic controlled.

Although most commercial rice cookers use mechanical switch, there are still electronic controlled units on the market. One of them is Aroma brand commercial rice cooker. This cooker can be found at Wal-mart and Sam's Club on-line store. This cooker has an electronic switch and electromechanical relay that will beep each time the power is on. If you defeat the mechanism, the cooker will not be safe to use. Another problem is the sharp edge on the lid. It will damage the sensor cable quickly. The lid of the rice cooker has to have a rolled edge to prevent it from cutting the cable. We don't recommend any rice cookers that do not have a rolled up edge on lid.



Note #3, Aroma cooker and Winco cooker look very similar from distance. However, their switches are totally different. Aroma will not work but Winco is highly recommended. Both are US brands made by Chinese manufacturers. User from other countries might find similar products under different brand names. Please make sure to choose the right type switch.

Summary,

WS-1400A controller creates a new method for making SV. Compared with the traditional circulation water bath method, it has many advantages. Its compact size takes very little space on the countertop and storage. The cooking device (slow cooker or rice cooker) can be used for other purposes when not cooking SV. It is energy efficient, consuming 1/3 to 1/5 of the power of a circulation water bath. When cooking a meal for 20 hours, it will save several kWh of electricity. It is quiet, no pump noise, no relay noise. The temperature precision is more than adequate. Although the resolution of the display is one degree, the precision and uniformity is in the 0.2-0.5 °C range when used with rice cooker. Most importantly, the cost of controller plus a cooker is only a fraction of that for the circulation water bath, making SV home cooking possible. The lower cost is also important for restaurant business. For the price of one circulation water bath, ten pots can be set up with different temperatures setting for different meals, saving a significant amount of costs.

One limitation found in restaurant testing is for cooking seafood that needs less than 30 minutes of cook time. Without the water circulation, the time needed for same size pack to reach the set temperature might vary slightly if it is placed differently. User needs to stir the water every few minutes to prevent any cold spot. However, this is not a big problem because the cooking time is short. This is not an issue for cooking that takes longer than 30 minutes.

Note added on September, 2008,

Our controller users informed us that Black & Decker carries a commercial line of rice cooker with good quality and very competitive price. e. g. the price of a 28 cup Black & Decker rice cooker at Newegg.com is about \$30.