

ALL-GRAIN BREWING INSTRUCTIONS

Welcome to the next level of brewing! All-Grain brewing is a lot of fun, and the quality of your beer is going to increase significantly. All-Grain brewing can be very complex, but don't be afraid, that's what makes it an art form! We are going to make it easy for you, and all you need is a larger grain bag!

This instruction guide is intended to give you the basic principles of All-Grain brewing. We will touch on many high-level subjects and also try to make this guide relevant to as many brewing styles as possible.

These instructions are geared for a brew-in-a-bag (BIAB) or three-vessel single-infusion mash setup, but can easily be modified for any system or size. This will also be perfect for any all-in-one brewing setup or single-vessel system.

The two methods noted here are actually very similar in theory and you can achieve similar results in the end. In a single-vessel system or BIAB setup, everything is done in one kettle, which serves as both your mash tun and boil kettle. In a three-vessel system, you'll use a boil kettle, mash tun, and hot liquor tank to do specific steps to create your wort.

GETTING SET UP

OVERVIEW OF ALL-GRAIN BREWING:

- Clean and set up all-grain system
- Create recipe
- Calculate mash water/start water
- Heat/treat water for mash (152–154°F + __°F for temp drop)
- Stir in grains for 3 minutes
- Mash for 60 minutes
- Collect 1–2 gallons more than final volume of wort
- Proceed as you would in an extract batch

NECESSARY EQUIPMENT:

- **BOIL KETTLE:** 8-gallon or larger kettle.
- **LARGE GRAIN BAG:** To hold between 8–16 pounds of grain depending on the recipe.
- **HOT LIQUOR TANK:** Vessel that can hold hot water to sparge with. A cooler or a second large kettle is a perfect example of a Hot Liquor Tank.

OPTIONAL EQUIPMENT:

THREE-VESSEL SYSTEM: One of the most common setups is a three-vessel system to fly or batch sparge. Ideally, these vessels would be on a stand, but you can use gravity or other ways of making the three kettles work in unison. Requires the following equipment:

1. **BOIL KETTLE** capable of collecting 2–3 gallons more than the intended final volume.

2. **MASH TUN WITH FALSE BOTTOM** vessel at least as big as the intended final volume. Equipped with a sparge arm or ring for rinsing the grain.
3. **MASH PADDLE** or large spoon for stirring.
4. **HOT LIQUOR TANK** vessel that can hold hot water to sparge with.
5. **HIGH TEMPERATURE PUMP(S)** this is essential if your three vessels aren't arranged to use gravity to transfer from vessel to vessel. A pump will also improve the recirculating/vorlaufing process, which leads to better clarity in the mash and boil kettle.

pH TESTING: The Mash pH is critical for good conversion and overall sugar extraction, which leads to hitting your target gravity. Ideally you would use a water test kit to make sure you have the ideal water profile, then use salts and acids to adjust from there if necessary. But using a pH mash stabilizer will also work to get you near the median pH of 5.2.

BREWING SOFTWARE: We highly recommend using a brewing software, which will help plan your brew day and make it easier to repeat those great recipes. If not using a software, take good notes throughout the process so you can adjust your methods on your next brew day if necessary.

THE BREWING PROCESS

THE MASH

Enzyme Process Converting Starches to Sugars

MASH WATER CALCULATION:

If you are brewing with a single vessel or using the Brew-In-A-Bag method, then you will want to calculate the amount of water that you are going to start with. This will represent your mash water. Here is a calculation for achieving this:

$$\text{“Grain Absorption”} + \text{“Finished Batch Size”} + \text{“Boil Off Rate”} \\ \text{(60 min boil)} + \text{“Trub Loss”} = \text{Start Water}$$

For Grain Absorption, we have assumed 0.12 gallons of absorption per pound of grain. Finished batch size is what you want in the fermenter, so usually you'll aim for around 5.25 to 5.5 gallons to yield 5 gallons of finished beer. The Boil Off Rate will vary by kettle size and altitude, but assume a bare minimum of 0.5 gallons. Finally, Trub Loss is the volume lost or left behind in the boil kettle and will be greater with the amount of hops used. (If doing BIAB skip to “Add Filtered Water.”)

If you are brewing with three vessels, then you will want to calculate the amount of water needed for the mash tun. From your recipe, add up the total pounds of grain to be used. Make sure to include everything under the “All-Grain” column and everything under the “Specialty Malts” column to get your total number. From this number we can figure out how much water we need to start with. As a basic rule of thumb, we recommend 1.1 quarts of water per pound of malt. When doing this calculation please be aware of how much “dead space” you have under the false bottom and add that volume of water to the number that you calculate below.

$$\text{Calculate mash water: } \underline{\quad} \text{ lbs} \times 1.1 \text{ qts} = \underline{\quad} / 4 = \underline{\quad} \text{ Gallons}$$

ADD FILTERED WATER:

If you are using a designated mash tun, make sure you have your false bottom in the bottom of the kettle. Fill your Mash Tun with the amount of calculated mash water or start water.

Important Note: *Water is one of the most critical ingredients to an award-winning beer. Using RO water to start with a clean slate and building the correct water profile is ideal. If you are using tap water, we recommend using a water test kit to identify your existing water profile and then use brewing salts and acids to make adjustments as needed. At a bare minimum, use a carbon activated filter to remove chlorine or Chloramines from your tap water. Carbon filtering also has the advantage of removing any bad flavor that is organic in nature. Lastly be aware of your mash pH if you are having issues with conversion.*

MASH TEMPERATURE:

Mash Temperature plays a very important role in the flavor of the final beer. Most recipes will have you hold the mash at a

temperature between 148°F and 158°F for 60 minutes which is sufficient for activating the naturally occurring enzymes in the grains to convert starches into sugars.

Certain recipes will have you stray from this range and timeline but those are the outliers.

Within that range, the low end (148–152° F) will produce an overall dryer beer, while the high end (154–158° F) will produce a beer with a maltier flavor. The middle range of 151–154° F is a great compromise for most beers. When adding the grain to the water, plan for temperature drops of 9–15° F since the grain is sitting at room temperature.

MASHING:

- The first step is to calculate the strike water temperature so that you achieve the correct mash temperature after your grains have been added to the water.
- For BIAB, you only typically lose around 4–6°F. Single-vessel systems are similar in temperature loss.
- For a designated mash tun, you want to figure on a drop of 10°F if you are in a warm environment, and 15°F if you are in a cold environment.
- So, first decide on your desired mash temperature according to the section above and then add the expected temperature loss on top based on your brewing method and environment to calculate your strike temperature.
- Heat the water up to the strike temperature that you calculated.
- If you are doing the BIAB method then ideally you will want to carefully put your grain bag in the kettle and attach it to the sides of the kettle. For a single-vessel system, put your grain in your mash basket.
- Once you have reached the strike temperature, steadily add the grain to the water while stirring, making sure to break up any clumps (aka “dough balls”). Always add grain to water, not water to grain.

Important Note: *Make sure all of the grain stays inside the grain bag if you are doing the BIAB method. You will want to tie off the sides of the bag or just be very careful.*

- Continue stirring for a few minutes after the grain has been added to make sure that the entire mash is a consistent temperature and that all dough balls have been eliminated. In most scenarios, letting the mash sit for 60 minutes at 148–160° will result in full enzymatic conversion of the starches to sugars.
- Make sure the lid is placed on the mash to retain heat. If you are brewing in a very cold environment, you might consider insulating the mash vessel, but in most situations, the large

thermal mass of the mash will hold the temperature just fine. If you should miss your target temperature, it is easiest to add hot water or cold water to move it a few degrees up or down.

Important Note: *We do not recommend adding flame under the vessel, as it is very easy to scorch the grains, causing off flavors.*

RECIRCULATION (Optional, not for BIAB):

A little step in-between mashing and sparging that helps clear up the runoff from the mash.

- Recirculate by removing wort from the spigot below the false bottom, and adding it back to the top of the grain bed. A pitcher works great for this purpose. Do this until the runoff is nearly free of visible debris, then you can start the sparge.

THE SPARGE *Rinsing The Sugars*

Regardless of the system you are using, the goal is the same. You are trying to collect as much of the wort or sugar water that you just created as possible without having any grain left. You will always leave a little sugar water inside the grain when trying to take it out but the secret is to take your time.

IF USING A BIAB SETUP:

Important Note: *Please be sure to use thick rubber gloves as the grain and runnings are extremely hot.*

- Remove the bag of spent grain from the kettle. To make sure you extract as much sugar as possible, you can hold the bag over the kettle and let it drain. A pulley system is great for this step, or you can simply set the bag on a mash paddle over the kettle. For all single-vessel systems your goal is to extract as much sugar as possible while collecting enough volume. Just be careful.

IF USING A THREE-VESSEL SYSTEM:

- **Calculating Sparge Water:** An easy way to calculate sparge water is to plan on using 1/2 gallon for every pound of grain used in the mash. This simplified calculation ensures you have more sparge water than you will actually need.

SPARGE:

Temperature plays a key role in sparging; it is best to be as close to 170°F without going over. At this temperature, you will dissolve the sugars without leaching tannins from the grain husk.

- To begin the sparging process, open the Hot Liquor tank valve and allow the water to flow onto the grain bed. A simple hose will work for this process; however, a stationary sparge arm is a time saving addition.
- Connect a piece of tubing onto the ball valve on the Mash Tun and allow it to run into the boil kettle.
- Open the valve on the bottom of the Mash Tun, allowing the hot sparge water to flow through the mash. Try to get the same flow of water coming into the Mash Tun as wort flowing out of

the Mash Tun and into the boil kettle. Keep at least a two-inch layer of water on top of the grain bed to keep incoming sparge water from channeling through the grain bed.

- We recommend a slow sparge, usually taking 45–60 minutes to ensure that there is plenty of time for the sugars to rinse out.

THE BOIL:

- Sparge until you have collected 1–2 gallons of wort over the final amount you want (depends upon your batch size and boil off rate).
- Bring the collected wort to an even, rolling boil.
- Be careful not to “overboil”. Monitor your boiling wort and reduce the heat to prevent it from boiling over and creating a mess. Foam reducers are available to prevent overboil in the kettle.
- You typically boil for 60 or 90 minutes, adding hops and other ingredients as the recipe calls for.
 - Recipes are listed as time elapses, so a hop listed as “60 mins” would be added at the beginning of the boil and a hop listed as “5 mins” would be added 5 minutes before the boil ends, which would be 55 minutes into a 60-minute boil.
- Near the end of the boil make sure to add yeast nutrient and clarifier.
- We recommend that you whirlpool near the end of the boil if you can. This means bare minimum using your spoon to carefully stir the wort to cone your hops in the center of the kettle.

CHEERS!