

04 SMaSH Fuggle

Step 1: Enter Starting Water Profile

A. Profile	Calcium (Ca ppm)	Magnesium (Mg ppm)	Sodium (Na ppm)	Chloride (Cl ppm)	Sulfate (SO ₄ ppm)	<input checked="" type="radio"/> Bicarbonate (HCO ₃ ppm) <input type="radio"/> Alkalinity (CaCO ₃ ppm)
Starting Water Profile: (ppm = mg/L)	41	9	67	0	44	178

If your water report gives Sulfate as Sulfur (SO₄-S) such as a Ward Lab's report, multiply by that by 3 to get SO₄

B. Volume	Mash Water	Sparge Water
Volume (liters):	3	6,1
(gallons):	0,79	1,61
% that is Distilled or RO:	0%	0%

Step 2: Enter Grain Info

Select Grain Type	Weight (kg)	Color (°L) (Crystal Malts Only)	Distilled water Mash pH (from chart)	grain types	dist water pH
Base - Maris Otte ▼	1		5,77	1 - Select Grain -	
- Select Grain - ▼	0		0,00	2 Base - 2-Row	5,70
- Select Grain - ▼	0		0,00	3 Base - 6-Row	5,79
- Select Grain - ▼	0		0,00	4 Base - Maris Otte	5,77
- Select Grain - ▼	0		0,00	5 Base - Munich	5,43
- Select Grain - ▼	0		0,00	6 Base - Pilsner	5,75
- Select Grain - ▼	0		0,00	7 Base - Wheat	6,04
- Select Grain - ▼	0		0,00	8 Base - Vienna	5,56
- Select Grain - ▼	0		0,00	9 Base - Other	5,70
- Select Grain - ▼	0		0,00	10 Crystal Malt	calculated
- Select Grain - ▼	0		0,00	11 Roasted/Toasted	4,71

Crystal Malt:
Caramel malts, Cara Munich, Cara Aroma, etc.

Roasted/Toasted Malt:
Roasted Barley, Black Patent, Carafo, etc.

Acidulated Malt:
Enter in Step 4a.

Total Grain Weight (kg): **1**
(lbs): 2,2

Mash Thickness: **3 l/kg**
1,44 qt/lb

The above values are used to calculate mash pH. They may vary depending on maltster or other factors - for example Rahr 2-Row has been found to be 5.56. Modify if necessary.

Step 3: View Mash pH

Effective Alkalinity (CaCO ₃ ppm)	Residual Alkalinity	ESTIMATED Room-Temp Mash pH	Desired Room-Temp Mash pH
146	90	5,86	5.4 - 5.6

Note: When measuring actual mash pH with a meter, keep in mind that it can take up to 15 minutes for mash pH to stabilize.

There are varying opinions on the optimum range here. Consider doing your own research and/or experimentation to determine what's best for you.

Step 4a: Adjust Mash pH DOWN (if needed)

Gypsum CaSO ₄	Calc. Chloride CaCl ₂	Epsom Salt MgSO ₄	Acidulated Malt acid content: grams: oz:	Lactic Acid acid content: ml:
0	0,31	0,09	2,0% 0	80% 0
Adjusting Sparge Water? (y/n): <input type="checkbox"/>			Typically 2.0%. Revise if necessary.	
Sparge Water Additions (grams): 0,0			Some recommend keeping this under 3%	

add at dough-in or prior.

add to boil, or to sparge water prior to sparging, or combine with mash salts when treating all water combined prior to brewing.

Step 4b: Adjust Mash pH UP (if needed)

Slaked Lime Ca(OH) ₂	Baking Soda NaHCO ₃	Chalk CaCO ₃
0	0	0
Adjusting Sparge Water? (y/n): <input type="checkbox"/>		
Sparge Water Additions (grams): 0,0		

add at dough-in or prior.

add to boil, or to sparge water prior to sparging, or combine with mash salts when treating all water combined prior to brewing.

Calculations for chalk's true affect on pH are very complex and may require an acid to fully dissolve. This spreadsheet uses half of chalk's full potential based on experimental data w/o acid addition. Results may vary.

Step 5: View Resulting Water Profile

	Calcium (Ca ppm)	Magnesium (Mg ppm)	Sodium (Na ppm)	Chloride (Cl ppm)	Sulfate (SO ₄ ppm)	Chloride / Sulfate Ratio
Mash Water Profile:	69	12	67	49	56	0,89
Mash + Sparge Water Profile:	50	10	67	16	48	0,34
Palmer's Recommended Ranges:	50 - 150	10 - 30	0 - 150	0 - 250	50 - 350	Below .77, May enhance bitterness

There are varying opinions on these ranges. Consider doing your own research and/or experimentation to determine what's best for you.