# 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) | Bicarbonate ($HCO_3$ ppm) / Alkalinity ($CaCO_3$ ppm) |
|---|---|---|---|---|---|---|
| Starting Water Profile: (ppm = mg/L) | 41 | 9 | 67 | 0 | 44 | 178 |

*If your water report gives Sulfate as Sulfur ($SO_4$-S) such as a Ward Lab's report, multiply by that by 3 to get $SO_4$*

**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

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

***Roasted/Toasted Malt:***
*Roasted Barley, Black Patent, Carafa, etc.*

***Acidulated Malt:***
*Enter in Step 4a.*

| | Select Grain Type | Weight (kg) | Color (°L) (Crystal Malts Only) | Distilled water Mash pH (from chart) |
|---|---|---|---|---|
| | Base - Maris Otte | 1 | | 5,77 |
| | - Select Grain - | 0 | | 0,00 |
| | - Select Grain - | 0 | | 0,00 |
| | - Select Grain - | 0 | | 0,00 |
| | - Select Grain - | 0 | | 0,00 |
| | - Select Grain - | 0 | | 0,00 |
| | - Select Grain - | 0 | | 0,00 |
| | - Select Grain - | 0 | | 0,00 |
| | - Select Grain - | 0 | | 0,00 |
| *Total Grain Weight (kg):* | | ***1*** | | |
| *(lbs):* | | *2,2* | | |
| *Mash Thickness:* | | ***3 l/kg*** | | |
| | | *1,44 qt/lb* | | |

| | grain types | dist water pH |
|---|---|---|
| 1 | - Select Grain - | |
| 2 | Base - 2-Row | 5,70 |
| 3 | Base - 6-Row | 5,79 |
| 4 | Base - Maris Otte | 5,77 |
| 5 | Base - Munich | 5,43 |
| 6 | Base - Pilsner | 5,75 |
| 7 | Base - Wheat | 6,04 |
| 8 | Base - Vienna | 5,56 |
| 9 | Base - Other | 5,70 |
| 10 | Crystal Malt | calculated |
| 11 | Roasted/Toasted | 4,71 |

*The above values are used to calculate mash pH. They may vary depending on maltser 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 | 74 | **5,85** | *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 $MgSO_4$ |
|---|---|---|---|
| *add at dough-in or prior.* | | | |
| Mash Water Additions (grams): | 0 | 0,55 | 0,09 |
| Adjusting Sparge Water? (y/n): | ☐ | ☐ | ☐ |
| Sparge Water Additions (grams): | **0,0** | **0,0** | **0,0** |

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

| Acidulated Malt | | Lactic Acid | |
|---|---|---|---|
| acid content: | 2,0% | acid content: | 80% |
| grams: | 0 | ml: | 0 |
| *oz:* | *0,0* | | |

*Typically 2.0%. Revise if necessary.*

*(0% of total wt)* *Some recommend keeping this under 3%*

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

*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.*

| | Slaked Lime $Ca(OH)_2$ | Baking Soda $NaHCO_3$ | Chalk $CaCO_3$ |
|---|---|---|---|
| *add at dough-in or prior.* | | | |
| Mash Water Additions (grams): | 0 | 0 | 0 |
| Adjusting Sparge Water? (y/n): | ☐ | ☐ | ☐ |
| Sparge Water Additions (grams): | **0,0** | **0,0** | **0,0** |

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

## 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: | 91 | 12 | 67 | 88 | 56 | 1,58 |
| Mash + Sparge Water Profile: | **57** | **10** | **67** | **29** | **48** | **0,61** |
| *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.*