

Fundamentals of Winemaking
Potassium Metabisulfite and Sulfur Dioxide

Review: Sulfur dioxide (SO₂) serves to 1) inhibit the growth of wild yeast, particularly non-wine yeast, 2) inhibit spoilage by bacteria, 3) stabilize color and reduce browning, 4) reduces effects of oxidation. Efforts should be made to minimize the total amount of SO₂ added to juice and wine. Adding more than recommend levels of SO₂ to juice or wine unnecessary, unhealthy, and decreases the overall quality of the wine.

Sulfur dioxide (SO₂) additions are measured in parts per million. One part per million is equivalent to one gram of SO₂ in one million grams of wine. It is also expressed as milligrams per liter, (mg/l), or 0.001 grams per liter. Therefore 40 parts per million is equal to 0.040 grams per liter or 0.040 g/l. This seemingly tiny amount is a significant value as it often takes very little to be effective. It is important to remember that one add only what is necessary for the desired effect.

There are a number of ways to add SO₂ to wine or must. For the home winemaker, potassium metabisulfite provides a convenient source of SO₂. Described below are two methods for adding relatively accurate quantities: by preparing a stock solution or by calculating for direct additions.

Stock Solution

A stock solution enables the winemaker to create a concentrated solution of available SO₂ that can be conveniently and accurately measured and added to juice or wine. These solutions have a shelf-life of about 4 months and should be stored well capped, out of direct sunlight and certainly out of reach of children. Be sure to affix a label to the stock solution bottle, noting the contents and the date it was prepared. It is important to use only fresh potassium metabisulfite in preparing the stock solution.

To create a 5% solution, dissolve 3 ounces or 5 tablespoons of fresh, pure, potassium metabisulfite in one quart of water. (Sodium bisulfite can be used to sterilize equipment. However, because of its toxicity, this chemicals should not be added to juice or wine as a source of SO₂.) Use the table below as a guide for SO₂ additions. Remember that potassium metabisulfite provides 57% by weight SO₂.

A reference is made to Campden tablets in the table below. Though Campden tablets may be a convenient means of measuring, unless the winemaker is confident in the freshness of the tablets, it is not recommended that they be used. Aside from chemical analysis or the guarantee of the chemical supplier, it is impossible to determine the potency of these tablets, or for that matter any chemical. Over time potassium metabisulfite converts to bisulfate and loses its antiseptic, antioxidant qualities.

SO₂ Additions Table

PPM total SO ₂	Amount to add to 5 gallons must, juice, or wine				Typical dosage used for
	5% solution		Teaspoons metabisulfite	Campden tablets	
	Teaspoons	cc (ml)			
10	0.75	3.8		0.8	Subsequent rackings *
15	1.25	5.7		1.2	
20	1.5	7.6	1/8	1.6	
25	2.0	9.5		2.0	Fresh juice and must from clean, sound fruit and after first racking *
30	2.25	11.4		2.4	
40	3.0	15.1	1/4	3.2	
50	3.75	18.9		4.0	For grapes with botrytis or rot
75	5.75	28.4	1/2	6.0	
100	7.75	37.9		8.0	

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* If malolactic (ML) fermentation is desired, do not add any additional sulfite until ML is complete.

Calculations for direct SO₂ additions using potassium metabisulfite.

To calculate direct potassium metabisulfite additions expressed in parts per million for any volume of wine, use the equation below. The equation assumes that you are using fresh potassium metabisulfite and therefore providing a theoretical 57.6% of SO₂ by weight.

To determine how many grams of potassium metabisulfite to add, multiply the desired ppm by the number of liters of wine and divide this by the percent SO₂ provided by potassium metabisulfite (KMB). Again, 10 parts per million is equal to 0.010 grams per liter or 0.010 g/l.

$$\frac{\text{ppm desired in grams} \times \text{Liters of wine (3.785 L} \times \text{gallons of wine)}}{0.576} = \text{grams of KMB}$$

Therefore, a 40 ppm addition to a 5 gallon carboy of wine would be calculated as:

$$\frac{0.040 \times 3.785 \times 5}{0.576} = \frac{0.757}{0.576} = 1.31 \text{ grams}$$

A 35 ppm addition to 55 gallons of must would be calculated as:

$$\frac{0.035 \times 3.785 \times 55}{0.576} = 12.65 \text{ grams}$$

Use the table below as a quick reference guide for SO₂ additions. To find SO₂ additions for other volumes not listed, add the appropriate columns. For example, to add 35 ppm SO₂ to 35 gallons of grape must, an addition of 8.05 grams would be necessary. If you do not have access to a gram scale, refer to the *Equivalency Tables* to determine the equivalent weight-to-volume measurement.

Grams of potassium metabisulfite required for direct addition of SO₂ in grape must or juice.

ppm SO ₂	2 gallons	5 gallons	10 gallons	20 gallons	30 gallons	40 gallons	50 gallons
20	0.26	0.66	1.31	2.63	3.94	5.26	6.57
25	0.33	0.82	1.64	3.29	4.93	6.57	8.21
30	0.39	0.99	1.97	3.94	5.91	7.89	9.86
35	0.46	1.15	2.30	4.60	6.90	9.20	11.50
40	0.53	1.31	2.63	5.26	7.89	10.51	13.14
45	0.59	1.48	2.96	5.91	8.87	11.83	14.79
50	0.66	1.64	3.29	6.57	9.86	13.14	16.43
60	0.79	1.97	3.94	7.89	11.83	15.77	19.71
65	0.85	2.14	4.27	8.54	12.81	17.09	21.36

Washing Solution

To create a washing solution (2,500 ppm) dissolve 3 teaspoons of bisulfite in one gallon of cold water. Wash all equipment, tubing, bottles, etc. that will come in contact with juice or wine with this

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solution. Do not mix this washing solution with any other chemical or leave it in wine bottles before bottling. Rinse thoroughly with hot water to remove any sulfite before bottling or storing equipment.