



Free SO₂ by Aeration-Oxidation

Another MoreManual!

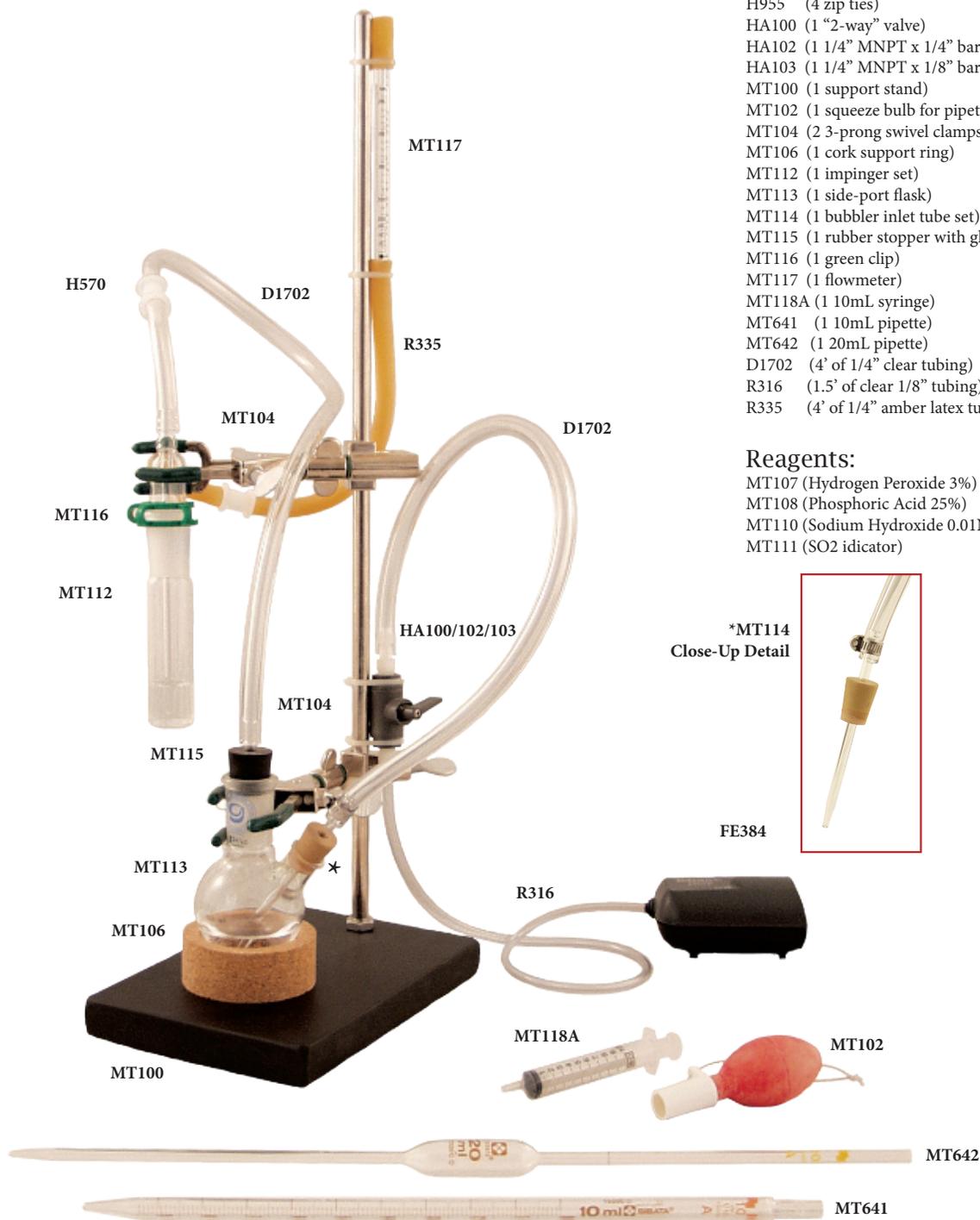
Provided by **MoreWine!™**
 A MoreFlavor!™, Inc. Brand
 www.MoreWineMaking.com
 1-800-600-0033

Kit Item Check-List:

- FE384 (1 pump)
- H570 (2 "quick-disconnect" assemblies)
- H950 (1 hose-clamp)
- H955 (4 zip ties)
- HA100 (1 "2-way" valve)
- HA102 (1 1/4" MNPT x 1/4" barb)
- HA103 (1 1/4" MNPT x 1/8" barb)
- MT100 (1 support stand)
- MT102 (1 squeeze bulb for pipettes)
- MT104 (2 3-prong swivel clamps)
- MT106 (1 cork support ring)
- MT112 (1 impinger set)
- MT113 (1 side-port flask)
- MT114 (1 bubbler inlet tube set)
- MT115 (1 rubber stopper with glass outlet)
- MT116 (1 green clip)
- MT117 (1 flowmeter)
- MT118A (1 10mL syringe)
- MT641 (1 10mL pipette)
- MT642 (1 20mL pipette)
- D1702 (4' of 1/4" clear tubing)
- R316 (1.5' of clear 1/8" tubing)
- R335 (4' of 1/4" amber latex tubing)

Reagents:

- MT107 (Hydrogen Peroxide 3%)
- MT108 (Phosphoric Acid 25%)
- MT110 (Sodium Hydroxide 0.01N)
- MT111 (SO₂ indicator)



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Congratulations on making an investment into the only truly accurate way to determine the “free” SO₂ level in a wine sample, Aeration-Oxidation! Before going any further, please open all the packaging for your kit and lay out the parts on a table so you can clearly see what you’ve got. Please double check the contents of your shipment against the list of parts on page 1 of this document. If anything is missing please contact our Customer Service Dept immediately.

The next step is to assemble the system, which should be simple and straightforward. Simply assemble the system so that it matches what you see in the photo on the front page. Here are a few tips that may help:

- The gray plastic ball valve will have two barbed fittings to install in it, one with a 1/8” barb and the other with a 1/4” barb. The 1/8” barb is for the tubing which runs to the aquarium pump, and should be oriented facing downward when you attach the valve to the support bar.
- The H570 plastic Quick Connects are designed to allow you to remove the Impinger from the system for cleaning. The exact position they are installed in does not matter.
- We have supplied you with an excess of tubing for all portions of the system. Please trim the tubing to fit appropriately and either keep or discard the excess.
- When installing the flow meter, please ensure that the zip ties hold the meter itself firmly and are not only holding the tubing in place, or you may have an issue with a flying flow meter.
- Though you can’t see it in the photo on page 1, the Impinger Set consists of 2 pieces which are held together by the green plastic clamp, MT116. You should install the Impinger Set so that the side port of the system sits between the 2 prongs of the clamp. It will hang slightly off center. This way you can remove the green clamp and the reservoir for the impinger will slide down for filling/cleaning/titration.

Overview

In brief, the procedure involves adding an acid and then agitating a wine sample so that the Free SO₂ gets driven off as a gas. By design, the only way for the gas to exit the system is to be passed through an impinger that is filled with Hydrogen Peroxide and a colored indicator. As the gas passes through the solution, the Hydrogen Peroxide actually converts the SO₂ to Sulfuric Acid. As a result of the change in pH from making the acid, the indicator changes color from gray-green to purple. Upon reaching the end-point of the test, you then neutralize the Sulfuric Acid you made with a base, Sodium Hydroxide (NaOH). Since all the acid was made from the SO₂ in your wine sample, a simple calculation can relate the amount of NaOH that was needed to neutralize the acid to the amount of SO₂ that was originally present in the wine sample. We strongly recommend that you read through the entire set of directions before performing the test. So, let’s begin:

Equipment needed

-MT130 (this contains all of the basic equipment needed to run the test*)

**Note: If you will be frequently running multiple tests during a single session, then you may want to think about investing in a titration stand with a self-zeroing burette (MT150).*

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Reagents involved:

- MT107A (3% Hydrogen Peroxide, same as what you buy at the drugstore)
- MT111 (SO₂ indicator)
- MT110A (0.01N NaOH (Sodium Hydroxide))
- MT108A (25% Phosphoric Acid)

Setting-up the test

Preparing the impinger

- 1) Fill the impinger with 10ml of 3% Hydrogen Peroxide (there is a thin, white line that has been etched onto the impinger tube that serves to indicate the 10ml fill level). Be sure to use at least 10mL. A little more won't hurt, but be careful you don't overfill the impinger or you could make a mess once the test starts
- 2) Now add 3 drops of the SO₂ indicator into the 3% Hydrogen Peroxide and gently swirl the tube to mix the two together. The solution should now have a gray-green or magenta color. When using store-bought hydrogen peroxide it is common for the solution to turn magenta when the indicator is added, as the peroxide is slightly acidic. You want to correct this with 1-3 drops of NaOH until you have a gray-green color.*

**Note: Adding the NaOH adjusts the pH of the solution and thus changes the color of the indicator. There is a fairly narrow pH range where the solution will be the correct gray-green color: any more acidic and it will turn back to magenta and any more basic it will turn bright green. At the end of the test you'll be adding NaOH to the then magenta solution (magenta because you made it acidic when you created the sulfuric acid) until you get it back to gray-green. Because the outcome of the test is based on how much NaOH this takes, it is important to have the correct starting point and the correct end point. SO, when adjusting the solution prior to running the test, go slowly and careful not to overshoot the gray-green color and go into the bright green by more than a single drop of NaOH. If you overshoot by too much, discard the peroxide and start again.*

- 3) Install the reservoir of the Impinger Set on to the impinger itself and secure it with the green plastic clip. This portion of the preparation is not complete.

Preparing the wine sample

- 1) Using the 20mL volumetric pipette and the red pipette bulb, transfer 20mL of wine sample into the 100mL, round, side-port flask. Attach the stopper with the tube that runs up to the impinger.
- 2) Using the 10mL serological pipette and the red, pipette bulb, transfer 10mL of 25% Phosphoric Acid into the 100mL, round, side-port flask.
- 3) Quickly attach the bubbler stopper to the flask, making sure both stoppers are snugly attached.*

**Note: Upon addition of the Phosphoric Acid, the Free SO₂ will immediately begin to volatilize out of the wine sample. In order to maintain the accuracy of the test, it is important to minimize the amount of gas that might escapes once the acid has been added to the sample; so you will want to be quick about getting the flask sealed once you've added the acid.*

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Running the Test

Once you have both the impinger and the wine sample prepared it is time to go ahead and run the test.

- 1) Making sure that the gray valve used to regulate the output of the pump has been set to the “off” position (perpendicular to the body of the valve), turn on the pump (plug it in).
- 2) Slowly turn the valve to the “on” position. The wine sample, as well as the Hydrogen Peroxide solution inside the impinger will begin to bubble, and the flow-meter at the top of the stand will begin to register. Adjust the valve so that the small, gray ball of the flow meter floats at an average reading of around 1000ml/min (this is located in the middle of the flow-meter). The valve should be all the way open.
- 3) Allow the test to run for 10-15 minutes. As mentioned above, if there is Free SO₂ present the sample will change color from gray-green to magenta. A lack of a color change indicates one of two things: A) (most common) There is no SO₂ in the sample; or B) Your Hydrogen Peroxide is old and has gone bad. Once opened the peroxide has about a 2-3 month shelf life and you will be able to tell that it is spend because it will no longer turn the indicator magenta right away.
- 4) Once the test has gone to completion, turn off the pump. Unfasten the clip and carefully remove the impinger tube.
- 5) Now it is time to add the NaOH. Draw 7-10 mL of NaOH into the syringe that was included with the kit. The exact amount you start with is not important, only that you note the starting volume accurately. Begin slowly adding the NaOH a drop at a time and swirling the flask to mix it thoroughly between drops.

**Note: Do not get carried away and begin adding several drops at a time – the color will change very quickly from magenta to gray-green, usually within 1-3 drops, and adding too much at once can cause you to overshoot the endpoint by an unknown amount. Once the solution in the impinger flask is the same color it was before you started the test, make a note of the volume remaining in the syringe.*

- 6) The difference between the starting volume in the syringe and the final volume in the syringe is the amount of NaOH you used. This is the value you’ll use to calculate the amount of SO₂ that was originally present, according to the formula below.

Free SO₂ (ppm) = mL NaOH used x 16

Example: If 1.7mL NaOH was needed to reach the endpoint of the test, then:

1.7mL x 16 = 27.2 ppm of Free SO₂ is present in the wine sample.

**Note: The above formula only holds if you are using 0.01N NaOH, which is the concentration we include with this kit and sell as a supply. Do not confuse this with 0.1N NaOH which is the strength used for TA testing. Using 0.1N for this test is not feasible because of the large difference in strength.*

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Important Information

- You will need to store the Hydrogen Peroxide tightly-sealed and in the refrigerator, but will need take it out and allow it to warm to room temperature before using it to run your tests. The strength of the Hydrogen Peroxide used in the procedure (3%) is more than adequate for the needs of the test, and it will remain effective around three months once opened.
- The NaOH should be stored sealed and in the fridge as well, and also returned to room temp prior to use. This concentration of NaOH should keep for 3-4 months. Past that time you can standardize the reagent if you are familiar with that process, or simply order a fresh bottle as it is inexpensive and we turn over stock quickly.
- To avoid any loss of gas in the system (and therefore lower the accuracy of the results), make sure all of the connections are tight.
- Make sure to maintain a flow rate of ca. 1000ml/min while running the test. If the indicator ball of the flow-meter fluctuates wildly (and you are sure your connections are tight), then you probably need to make sure that the two stoppers of the side-port flask are properly seated as to ensure a tight seal.
- We strongly recommend picking up a Laboratory Wash Bottle (MT644) for cleaning out the flasks and your pipets.
- **Important:** While the small amount of Sulfuric Acid that you create during the test is neutralized at the end, the 25% Phosphoric Acid that you used to drive the SO₂ out of the wine sample is not consumed at any point. This means that it is still present in the spent sample at the end of the test. For the benefit of our environment, we request that you discard this sample in a plastic bucket and neutralize it with baking soda prior to putting it down the sink or toilet. You'll be able to tell when it is safe to discard because the solution will turn green and stop foaming when you add baking soda if it is neutral.
- If at any point you believe that you have gotten some of the Phosphoric Acid on your skin, you should immediately stop what you're doing and rub the area down with baking soda, which will neutralize the acid. **Please note that a chemical burn does not set in immediately the way a heat burn does, but can be just as painful and damaging to tissue.**

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