



MoreInstructions™

Volatile Acidity Determination

Congratulations!

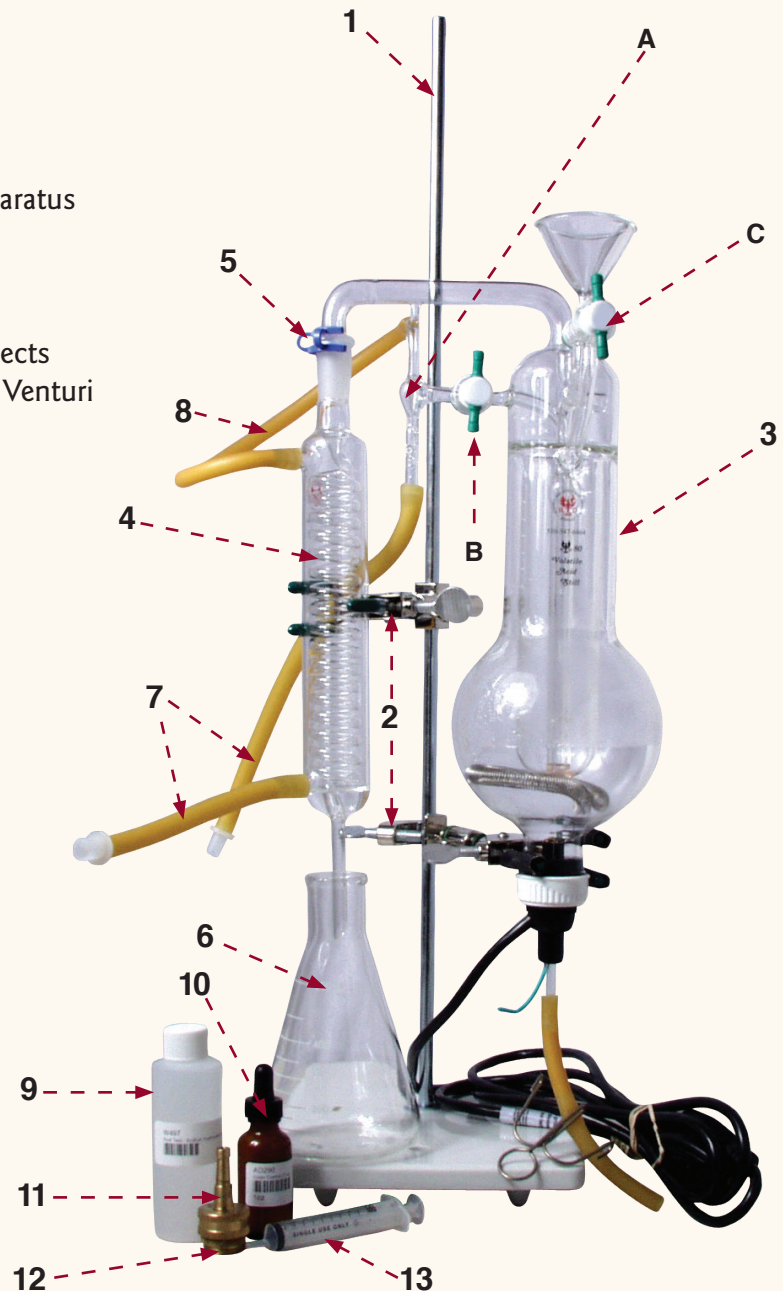
Your new MT160 Volatile Acidity Determination kit is built around the high-quality, hand made RD80 Volatile Acidity Still. This still has been designed and manufactured to give you years of easy, reliable results. Let's get started! Please take a moment to review your package and make sure that all of the parts listed below are there and intact.

Kit Contents:

- 1) Support Stand
- 2) 3-Prong Clamps
- 3) RD80 VA Still Assembly w/ Venturi Apparatus
- 4) Condenser
- 5) Plastic Keck Clamp
- 6) 250 mL Erlenmeyer Flask
- 7) Amber Pigtails w/ Plastic Quick Disconnects
- 8) Amber Tubing to connect Condenser to Venturi
- 9) 4 oz 0.1N Sodium Hydroxide (NaOH)
- 10) 1 oz Phenolphthalein Indicator
- 11) Tubing Adapter
- 12) Sink Faucet Adapter
- 13) Plastic 10 mL Syringe

Other Important Parts:

- A) Venturi Apparatus
- B) Venturi Stopcock
- C) Liquid Stopcock



Assembling the Apparatus:

- Remember that you're working with expensive glass parts, so take care and take your time. We strongly recommend starting out by reading these instructions thoroughly and ensuring that you understand every step. If you have any questions, stop what you're doing and give us a call at 800-823-0010 or write us at support@morewinemaking.com.
- Start by assembling the stand for the VA still. With the threaded end of the support bar showing through the center hole in the white porcelain base, thread the lock nut onto the end of support bar and tighten with a wrench so that you can't loosen the support bar by turning.
- Attach the first 3-pronged clamp to the support bar and open the jaws. Clamp the base of the main portion of the VA still to the support bar. Be sure that you have a good grip on the still with the clamp – but be careful not to over-tighten the jaws, which could crack the base of the still. The single clamp should easily be able to support the still on its own.
- Now take the second clamp and loosen the set screw which holds the clamp to the support bar enough so that you can slide the clamp on and off from the side. Don't attach it to the support bar yet, as you may need to adjust the length of the clamp for the best fit.
- With the clamp in one hand, use the other to hold the condenser up to the outlet of the still. Check to see that the second clamp will be long enough for the jaws to firmly support the condenser. If not, the clamp can be lengthened by loosening the rear wing-nut and then turning the base of the clamp. When you reach the correct length for the clamp, re-tighten the wing-nut to hold the clamp at this length.
- Go ahead and attach the clamp to the support bar and place the condenser through the jaws of the clamp. Fit the tapered, ground glass connection between the condenser and the rest of the still, and tighten the jaws of the second 3-pronged clamp. Finally, secure the junction between the condenser and the rest of the still with the blue plastic Keck clamp to ensure a tight seal.
- Be sure that you attach the short piece of amber tubing to the bottom outlet of the still and clamp it closed as shown in the picture of the test kit. If you don't, the first water that you put in through the top will run right out onto your bench!
- Next, we want to attach the amber tubing that will carry water to and from your condenser. The actual

path of the water through your condenser will be as follows: In through the bottom of the condenser, out the top and over to the venturi apparatus, then out the venturi back to the sink. Start by cutting a short piece of tubing and connecting the outlet (upper port) of the condenser to the inlet (again, upper port) of the venturi assembly. Take one of your plastic, push together Quick Disconnect (QD) assemblies and connect the male side of the QD to the tube coming off of the venturi and the female side of the QD to the tube at the bottom of the condenser. Now it is time to set up the lines that will run to and from the sink using the rest of your amber tubing. To the line that will feed water from your sink into the Condenser, attach the Tubing Adapter to one end and the male half of the remaining QD set to the other end. This piece of tubing will Quick Disconnect to the pigtail on the bottom of the condenser. For the return line, install the other half of the remaining QD. This line will connect to the outlet from the venturi and simply sit in the drain of your sink while the distillation is running. Again, the water for the Condenser is fed in through the bottom then goes through the venturi from top to bottom, and returns to the sink from the bottom of the condenser. Use the CE20 Sink Faucet adapter to thread the Tubing Adapter from the feed line onto your sink.

- Finally, you'll want to fill the reservoir in the main body of the still with enough water to cover the heating element well. There is a two-way stopcock in place just under the funnel at the top of the still. By examining the stopcock through the glass while turning it, you'll be able to see how in one position it delivers liquid to the outer, water chamber; and the other position delivers liquid to the inner, sample chamber. It is a good idea to mark one or both positions on the stopcock one way or another so that you don't have to figure this out every time you want to run a test. I painted the handle that goes in the "up" position for sample delivery on my stopcock with maroon (for wine) nail polish. Make sure the heating element is plugged in to an outlet with the appropriate power supply. Unless you specifically requested a 220V model, a standard household outlet is perfect.

Performing the Test:

- 1) Performing the VA determination is both fast and easy. The essence of the test is that you will use the heat from the boiling water in the outer chamber to drive the VA out of the wine in the inner chamber as it boils. The term "volatile" in "Volatile Acidity" means

that the type of acid that we're talking about in this test is naturally a gas at room temp and can easily gain enough energy to escape from the liquid that it is dissolved in. Heat is not applied directly to the wine sample because it could cause a change in the physical chemistry of the wine. As the VA is driven out, it is directed along the crossover tube and into the condenser. True to its name, the water flowing through the condenser cools the VA vapors and turns them into a liquid. This liquid is collected in a flask, along with a bunch of water, and then titrated with a Sodium Hydroxide (NaOH) solution until neutralized. A short calculation will tell us how much VA was collected during the test.

2) Begin by ensuring that the water level in the outer, boiling, chamber is sufficient to completely cover the heating element.

3) Next, you need to add a 10 mL sample of your wine to the inner chamber of the still. Don't forget to turn the position of the stopcock to direct the sample to the inner chamber. If you forget to change the stopcock, you'll need to empty out the still and clean it thoroughly so that there is no residual wine in there, otherwise this wine could interfere with future tests. Rinse the funnel and tubing with a couple of small volumes of distilled water to ensure all the wine gets down into the still.

4) Turn the stopcock to a closed position (handle oriented sideways), and make sure that the stopcock for the venturi apparatus is closed (vertical position).

5) Start the flow of water through the condenser. You don't need much of a flow rate to do the test, and turning the faucet on too high will cause the plastic QD fittings to blow apart, so be careful.

6) Position the 250 mL flask underneath the outlet from the condenser, and turn on the heating element.

7) As the sample boils, you'll see condensate start to form across the top piece and then in the condenser, where it will descend the spiral and drop into the 250 mL flask. You'll be collecting both VA, and water from both the wine and the boiling water in the outer chamber. Collect 50–75 mL of distillate, and turn off the heating element. Leave the flask in place to collect any residual distillate that is still in the system.

8) Once there are no more drops coming out of the condenser, remove the flask and allow the distillate to cool to room temperature. Once cooled, add 3 drops of the Phenolphthalein indicator.

9) Draw up a little bit more than 10 mL of the Sodium

Hydroxide (NaOH) reagent with the small plastic syringe. Invert the syringe and flick it hard a few times with your finger to dislodge any air bubbles and send them to the surface. With the syringe still inverted, expel any air that you've moved to the top. Turn the syringe back to the normal position (Plunger facing upward) and expel and remaining NaOH until you read an even 10 mL of liquid in the syringe. Don't worry if the NaOH gets on your skin a little bit, you should be fine.

10) Add the NaOH to the flask with your distillate in it slowly, swirling the flask at the same time. The endpoint of this process, called a titration, will be when the solution turns pink all the way through and this color persists for 20sec or more. Even the faintest shade of pink is acceptable, as long as it is persistent.

11) Note the number of mL of NaOH remaining in the syringe, and subtract this value from 10 to determine how many mL of NaOH you used in the test. Multiply this number by 0.06 to yield your VA in g/L of acetic acid: $(\text{mL NaOH used}) \times (0.06) = \text{VA in g/L acetic acid}$.

12) To remove your spent sample from the inner chamber: With water flowing through the condenser, open the stopcock for the venturi apparatus and watch the spent wine get sucked up and out into your drainage line. Rinse the inner chamber a couple of times with some distilled water and you're good to go. Drain the outer chamber if you're not planning on running any tests again any time soon in order to prevent mold from developing.

Interpreting Your Results:

High VA levels in a wine tend to indicate past or current oxidative spoilage, usually through the action of Acetobacter, the bacteria responsible for wine turning to vinegar. Monitoring VA during the wine's aging phase can help the winemaker to spot and address spoilage issues before they become more significant. Typical VA values for a table wine will be 0.3–0.4 g/L. One recent publication lists the legal limits for VA in commercial red and white wines respectively as: 1.4, 1.2 g/L in the US; 1.2, 1.1 g/L in California; and 1.1, 1.1 g/L in France. Your region may have tighter or looser controls on VA content, and acceptable levels can change over time. Consult your local TTB branch office for further information.