BREWLAB® PRO

Water Analysis Kit

Code 7190

LaMotte

BREWLAB® PRO

Welcome to the BrewLab® Pro — the professional test kit for craft brewing. Endorsed by world-renowned brewing author and consultant, John Palmer, the BrewLab Water Analysis Kit enables brewers to effectively measure and adjust the minerals in brewing water to improve beer flavor and yield.

BrewLab®, the only test kit a brewer needs to take control of their brewing water.

Beer and brewing have experienced a renaissance over the last 20 years as old beer styles have been rediscovered and new styles created, and home brewing has been at the heart of it. Beer and brewing are just like food and cooking — to make a great dish you need to understand your ingredients and seasonings, and brewing a great beer is the same.

Beer is 90% water and the quality and mineral content of the water can have a large effect on the beer's flavor.

NOTE: Samples should be at room temperature for all tests.

*Reagent is a potential health hazard.
READ SDS: lamotte.com
Emergency information: Chem-Tel USA 1-800-255-3924
Int'l, call collect, 813-248-0585

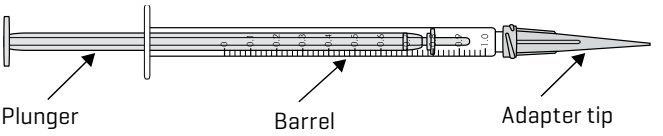
READ SDS

WARNING! This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

To order individual reagents or test kit components, use the specified code numbers.

Direct Reading Titrator General Directions

The Direct Reading Titrator consists of a plastic barrel, a plastic plunger, and a plastic adapter tip.



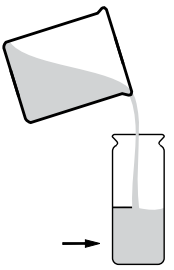
The adapter tip reduces the size of the drops that are dispensed and increases the precision of the test results. DO NOT REMOVE THE ADAPTER TIP.

INSTRUCTIONS

These are general instructions for the use of the Direct Reading Titrator. The titrator in the illustrations is an example. Refer to individual test kit instructions for test procedures and the actual range and increment values.

1

Fill the titration tube to the specified line with the water sample.

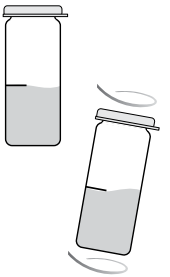


2

Add the reagents as specified in the instruction for the individual test method.

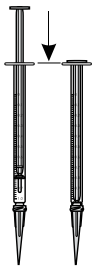
3

Cap the tube with the special titration tube cap. Mix by swirling gently.



4

Depress the plunger of the Titrator.

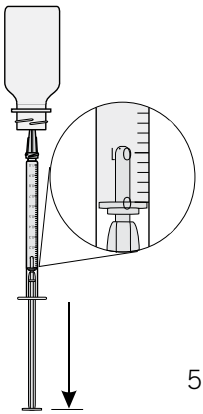


5

Insert the adapter tip into the special plastic plug in the titrating solution bottle.

6

Invert the bottle. Hold the bottle and the Titrator firmly together. Slowly pull out the plunger until the large ring on the plunger is opposite the zero (0) line on the scale.



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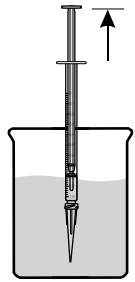
If an air bubble appears in the Titrator barrel or the adapter tip, partially fill the barrel and pump the titration solution back into the inverted reagent bottle to expel the bubble.

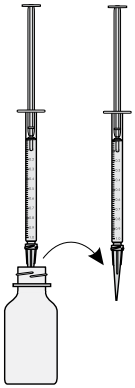
Note:

When filling the Titrator from a container without a special plug, submerge the adapter tip below the surface of the solution and pull out the plunger.



8

Turn the bottle right side up and remove the Titrator.



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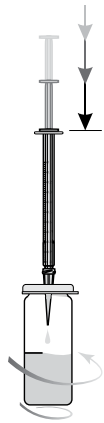
Insert the adapter tip into the opening in the titrator tube cap. Slowly depress the plunger to dispense the titrating solution. Gently swirl the tube to mix the solution.

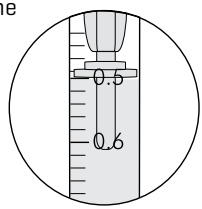


10

Continue adding the titrating solution until the specified color change occurs. If the color change does not occur when the large ring on the plunger reaches the bottom of the scale, refill the Titrator to the zero line. Continue the titration until the color change occurs.

11

Read the test result directly from the scale where the large ring on the Titrator meets the Titrator barrel. If the Titrator was refilled to reach the final color change, add the total amounts of titrant used to determine the final test result.



12

If no additional tests are to be made, discard the remaining titrating solution in the Titrator. Do not return the titrating solution to the reagent bottle. Thoroughly rinse the titration tube and the Titrator. Do not remove the plunger or the adapter tip from the Titrator.

CHLORIDE TEST

QUANTITY	CONTENTS	CODE
15 mL	*Chloride Reagent #1	*4504-E
2 x 30 mL	*Chloride Reagent #2	*4505DR-G
15 mL	*Phenolphthalein Indicator, 1%	*2246-E
15 mL	*Sulfuric Acid, 0.5N	*6090-E
1	Test Tube, 5-10-12.9-15-20-25 mL, glass, w/cap	0608
1	Direct Reading Titrator, 0-200	0382

PROCEDURE

1. Fill test tube (0608) to 15 mL line with sample water.
2. Add one drop of *Phenolphthalein Indicator, 1% (2246). If solution remains colorless, proceed to Step 3. If solution turns a pink color, add *Sulfuric Acid, 0.5N (6090) one drop at a time, mixing after each drop, until pink color disappears.
3. Add three drops of *Chloride Reagent #1 (4504). Cap and swirl to mix. Solution will turn yellow.
4. Fill Direct Reading Titrator (0382) with *Chloride Reagent #2 (4505DR). Insert Titrator in center hole of test tube cap.
5. While gently swirling tube, slowly press plunger to add *Chloride Reagent #2, one drop at a time, until yellow color changes to orange-brown.
6. Read test result directly from the scale where the large ring on the Titrator meets the Titrator barrel. Record as ppm Chloride.

   NOTE: If plunger tip reaches bottom line on Titrator scale (200 ppm) before endpoint color change occurs, refill Titrator and continue titration. When recording test result, be sure to include the original amount of reagent dispensed (200 ppm).

The chloride ion acts to bring out the sweetness and fullness of the malt flavor, much like table salt does for food. Craft brewers often add calcium chloride to brewing water for Pilsner and other lagers. The Brewlab® allows the brewer to test both of these parameters and plan salt additions to season the beer.

SULFATE TEST

Sulfate and Chloride ions in water affect the flavor balance of the beer—from hoppy to malty. The sulfate ion acts to accentuate the hoppiness and dryness of the beer, making it more crisp tasting. Craft brewers often add calcium sulfate to their brewing water for pale ales and IPAs.

QUANTITY	CONTENTS	CODE
50	*Sulfate Turb Tablets	*6456-H
1	Test Tubes, 2.5-10 mL, plastic, w/cap, with line	0106-WL
1	Octa-Slide 2 Viewer	1101
1	Sulfate Octa-Slide 2 Bar, 20-200 ppm	7779-01

PROCEDURE

1. Insert Sulfate Octa-Slide 2 Bar (7779-01) into the Octa-Slide 2 Viewer (1101).
2. Fill a test tube (0106-WL) to the 10 mL line with sample water.
3. Add one *Sulfate Turb Tablet (6456).
4. Cap and mix until tablet disintegrates.
5. Immediately insert test tube into Octa-Slide 2 Viewer with the printing on the tube facing away from the operator. Hold the Viewer so that non-direct light enters through the back.
6. Match sample with standards by comparing the degree to which the black lines are obscured by the turbidity (cloudiness) of the sample.
7. Disregard any differences in color between the sample and the standards. The test is based on the degree of turbidity, not color. Record as ppm Sulfate.

   NOTE: Thoroughly clean tubes after each use.

Octa-Slide 2 General Instructions

USE OF THE OCTA-SLIDE 2 VIEWER

ALKALINITY TEST

QUANTITY	CONTENTS	CODE
100	BCG-MR Indicator Tablets	2311A-J
60 mL	*Alkalinity Titration Reagent B	*4493DR-H
1	Test Tube, 5-10-12.9-15-20-25 mL, glass, w/cap	0608
1	Direct Reading Titrator, 0-200 Range	0382
1	Alkalinity Endpoint Color Chart	4491-CC

Each minor division on the Titrator scale equals 4 ppm $CaCO_3$. This test set provides total alkalinity readings only.

PROCEDURE

1. Fill the titration tube (0608) to 5 mL line with water sample.
2. Add one BCG-MR Indicator Tablet (2311A). Cap and swirl to mix until tablet dissolves. Solution will turn blue-green.
3. Fill the Direct Reading Titrator (0382) with *Alkalinity Titration Reagent B (4493DR). Insert Titrator into center hole of test tube cap.
4. While gently swirling tube, slowly press plunger to titrate until the solution color changes from blue-green to purple. Consult Alkalinity Endpoint Color Chart (4491-CC).
5. Read test result directly from the scale where the large ring on the Titrator meets the Titrator barrel. Record as ppm Total Alkalinity in ppm Calcium Carbonate ($CaCO_3$).

   NOTE: If plunger tip reaches the bottom line on the Titrator scale (200 ppm) before the color change occurs, refill the Titrator and continue the titration. When recording test result, be sure to include the value of original amount of reagent dispensed (200 ppm).

Alkalinity is generally a problem in brewing water. Alkalinity is the carbonate and bicarbonate content of the water, and acts to raise the pH of the mash and beer. Water hardness can offset the alkalinity, and for that reason both parameters are typically measured as "Calcium Carbonate" in order to determine the net effect. The Brewlab® enables the brewer to quickly determine the residual alkalinity and its effect on pH.

$$\text{Residual Alkalinity} = \text{Total Alkalinity} - \frac{[\text{Calcium Hardness} + (\text{Magnesium Hardness X } 0.5)]}{3.5}$$

All values are as ppm CaCO3

HARDNESS TESTS

Water hardness is a brewer's friend because calcium and magnesium are important ions in many biochemical reactions during mashing and fermentation. The Brewlab® can measure these parameters quickly and easily.

QUANTITY	CONTENTS	CODE
15 mL	*Sodium Hydroxide Reagent	*4259-E
50	Calcium Hardness Indicator Tablets	5250A-H
15 mL	*Hardness Reagent #5	*4483-E
50	Hardness Reagent #6 Tablets	4484A-H
2 x 60 mL	Hardness Reagent #7	4487DR-H
1	Test Tube, 5-10-12.9-15-20-25 mL, glass, w/cap	0608
1	Direct Reading Titrator, 0-200 Range	0382
1	Pipet, 0.5 mL, plastic	0353

NOTE: The Titrator is calibrated in terms of hardness expressed as parts per million (ppm) Calcium Carbonate as $CaCO_3$. Each minor division on the Titrator scale equals 4 ppm $CaCO_3$.

TOTAL HARDNESS TEST PROCEDURE

1. Fill a test tube (0608) to the 12.9 mL line with the sample water.
2. Add 5 drops of *Hardness Reagent #5 (4483). Swirl to mix.
3. Add one Hardness Reagent #6 Tablet (4484A). Cap and swirl until tablet disintegrates. Solution will turn red if hardness is present. If solution is blue, there is no measurable amount of hardness.
4. Fill Direct Reading Titrator (0382) with Hardness Reagent #7 (4487DR).
5. Insert the Titrator into the center hole of the test tube cap.
6. While gently swirling the tube, slowly press the plunger to titrate until the red color changes to clear blue.

Read the test result directly from the scale where the large ring on the Titrator meets the Titrator barrel. Record as ppm Total Hardness as ($CaCO_3$).
EXAMPLE: Plunger tip is 2 minor divisions below line 80. Test result is:

80 + (2 divisions x 4) = 88 ppm

NOTE: If the plunger reaches the bottom line on the scale (200 ppm) before the endpoint color change occurs, refill the Titrator and continue the titration. When recording the test result, be sure to include the value of the original amount of reagent dispensed (200 ppm). Parts per million $CaCO_3$ may be converted to grains per gallon (gpg) $CaCO_3$.

CALCIUM HARDNESS TEST PROCEDURE

1. Fill a test tube (0608) to the 12.9 mL line with the sample water.
2. Add 6 drops of *Sodium Hydroxide w/ Metal Inhibitor (4259). Cap and swirl to mix.
3. Add one Calcium Hardness Indicator Tablet (5250A). Cap and swirl until tablet disintegrates. Solution will turn red if hardness is present. If solution is blue, there is no measurable amount of hardness.

4. Immediately fill Direct Reading Titrator (0382) with Hardness Reagent #7 (4487DR).
5. Insert the Titrator into the center hole of the test tube cap.
6. While gently swirling the tube, slowly press the plunger to immediately titrate until the red color changes to clear blue.
7. Read the test result directly from the scale where the large ring on the Titrator meets the Titrator barrel. Record as ppm Calcium Hardness as ($CaCO_3$).

   NOTE: If the plunger reaches the bottom line on the scale (200 ppm) before the endpoint color change occurs, refill the Titrator and continue the titration. When recording the test result, be sure to include the value of the original amount of reagent dispensed (200 ppm).

MAGNESIUM HARDNESS TEST PROCEDURE

Subtract Calcium Hardness from Total Hardness. Record as ppm Magnesium Hardness as $CaCO_3$.

Magnesium Hardness (ppm $CaCO_3$) = Total Hardness - Calcium Hardness

ANALYSIS OF HIGH HARDNESS WATER

When waters containing very high levels of hardness (above 500 ppm) are to be tested, the sample must be diluted to a feasible concentration before titration. The kit is supplied with a calibrated pipet for performing the kit dilutions described below.

TOTAL HARDNESS DILUTION (1 TO 25.8)

1. Use the 0.5 mL pipet (0353) to transfer 0.5 mL of the water to be tested to the test tube (0608).
2. Dilute to the 12.9 mL line with distilled water.
3. Follow Steps 2 through 7 under the Total Hardness Test Procedure. Multiply Titrator reading by 25.8. Record as ppm Total Hardness as $CaCO_3$.

CALCIUM HARDNESS DILUTION (1 TO 12.9)

1. U se the 0.5 mL pipet (0353) to transfer 1.0 mL (two measures) of the water to be tested to the test tube (0608).
2. Dilute to the 12.9 mL line with distilled water.
3. Follow Steps 2 through 7 under Calcium Hardness test procedure. Multiply Titrator reading by 12.9. Record as ppm Calcium Hardness as $CaCO_3$.

MAGNESIUM HARDNESS OF HIGH HARDNESS WATER

Subtract Calcium Hardness from Total Hardness. Record as ppm Magnesium Hardness as $CaCO_3$.

Magnesium Hardness (ppm $CaCO_3$) = Total Hardness - Calcium Hardness

SODIUM (by calculation)

Since water has a neutral charge, the total number of negatively charged anions must equal the total number of positively charged cations. Six ions typically make up 98% of the total ions so the sodium concentration can be estimated by testing for the five other ions.

Sodium acts in concert with chloride to enhance the sweetness and fullness of the malt, but just as in food and cooking, too much can oversalt the beer and result in salty or metallic flavors. Sodium is ubiquitous in water supplies and mineral additions, so it is important for the brewer to know how much the water has before any treatments are planned. Sodium can be easily determined by calculation from the results of the other tests.

Negative Ions

$$\frac{\square\ \text{Chloride (ppm)}}{35} + \frac{\square\ \text{Sulfate (ppm)}}{48} + \frac{\square\ \text{Total Alkalinity (ppm as } CaCO_3\text{)}}{50} = \mathbf{A}$$

Positive Ions

$$\frac{\square\ \text{Total Hardness (ppm as } CaCO_3\text{)}}{50} = \mathbf{B}$$

$$\square\ \textbf{Sodium (ppm) = (A – B) X 23}$$

NOTE: The Total Hardness result incorporates two ions — calcium hardness and magnesium hardness.

pH & TEMPERATURE

The chemistry of brewing and cooking is complex, and while knowing the mineral content of the water is a critical first step to predicting the impact of the water to the beer, the best way is to measure it, and that is where pH comes into the picture. The mineral content of the water directly affects the pH of the mash, and the pH of the mash affects the entire brewing process – both in process performance and beer flavor. In order to consistently brew great beer, the pH of the mash, wort, and beer should be monitored at every step.

pH & Temperature · TRACER · 1766

For complete instructions, see the pH/TDS/Salt Tracer manual.

The Tracer pH meter is a high quality meter with an easy-to-clean flat sensor that allows the brewer to quickly measure very shallow samples. The meter is accurate to plus or minus one one-hundredth pH, allowing the brewer to measure the pH of the mash and wort to the tenths place with total confidence. You can easily see that your pH is closer to 5.3 than 5.4 or 5.2.

Water with a low pH can be corrosive. Water with a high pH can favor scale formation.

Before first use, hold the meter by the top battery compartment and swiftly tap the back of the meter downward into your palm (not a hard surface). This assures that the internal electrolyte moves to the very tip of the electrode. The electrolyte should fill the circular junction window at the tip of the electrode.

Before first use or after storage, soak the electrode in tap water or pH buffer solution for about 10 minutes.

For the most accurate results, allow sufficient time for the temperature of the probe to reach the temperature of the sample before calibrating. This will be indicated by a stable temperature reading on the display.

The Tracer will not give accurate pH readings on samples with low buffer capacity (distilled water).

CALIBRATION

The TRACER can be calibrated at 1, 2 or 3 points. For the most accurate results with a two point calibration, calibrate the TRACER with a pH 7 buffer first, then calibrate with either a pH 4 or pH 10 buffer whichever is closest to the pH value of the sample to be tested. When performing a three point calibration, calibrate with the pH 7 buffer first, followed with the pH 4 buffer and then the pH 10 buffer.

Preparation of Buffers

1. Fill a sample cup with 20 mL of distilled or deionized water.
2. Add one buffer tablet:

pH 4.0	Code 3983A
pH 7.0	Code 3984A
pH 10.0	Code 3985A

3. Use the tablet crusher (0175) to crush the tablet. Stir until the tablet has disintegrated

   NOTE: Buffers should be prepared fresh daily.

pH & TEMPERATURE

Calibration

1. Fill a sample cup to the 20 mL line with a buffer solution.
2. Press the **ON/OFF** button to turn the TRACER ON.
3. Place the electrode in the buffer solution. Press and hold the **CAL/RECALL** button until "CAL" appears in the lower display. The meter will automatically recognize the buffer and calibrate itself to that value. The circled number on the display will match the value of the buffer.

   NOTE: If the buffer solution is more than 1 pH unit off from 4, 7, or 10, or the electrode slope is low, the meter will assume that there is an error and the calibration will be terminated. "END" will be displayed.
4. During the calibration the pH value on the display will flash. When the calibration is complete, the TRACER will display "SA" and "End" and return to normal operation.
5. The appropriately circled indicator (L, M or H) will appear on the display when a calibration has been completed within one power on cycle.
6. For a two or three point calibration, repeat steps 1-5 with the remaining buffers.
7. When the TRACER is turned off, the circled indicator configuration and the calibration data will be memorized.

MEASUREMENT

1. For small samples fill a sample cup to the 20 mL line with the test sample. Sample depth must be greater than or equal to 1.5 inches.
2. Press the **ON/OFF** button. (8888 and then "SELF CAL" will appear in the display during the initial diagnostics).
3. Press and hold the **MODE/HOLD** button to scroll to the pH mode.
4. Immerse the TRACER electrode in the sample. Make sure the electrode is completely submersed.
5. Slowly stir the sample with the TRACER to remove air bubbles.
6. The reading will flash until it has stabilized. This may take several seconds depending on the buffer capacity of the sample.
7. Record the pH and temperature.
8. Rinse the electrode in distilled water. Replace the cap.

TDS

The measurement of total dissolved solids allows the brewer to quickly determine if there has been a shift or change in a water source or brewing process by measuring all solids in solution. It can also provide a valuable quality assurance check on demineralization processes and waste treatment effectiveness.

CONDUCTIVITY & TDS · TRACER · 1766

For complete instructions, see the pH/TDS/SaltTracer manual.

Before first use, hold the meter by the top battery compartment and swiftly tap the back of the meter downward into your palm (not a hard surface). This assures that the internal electrolyte moves to the very tip of the electrode. The electrolyte should fill the circular junction window at the tip of the electrode.

Before first use or after storage, soak the electrode in tap water or pH buffer solution for about 10 minutes.

CALIBRATION

Meter accuracy verification should be performed on a periodic basis as needed. **If calibration is required, the meter must be in the conductivity mode to perform all calibrations for conductivity and TDS.** The meter can perform calibrations and store the data for each of the three ranges–low, medium and high. The automatic calibration recognition procedure will recognize conductivity standards of 84µS (Low), 1413µS (Medium) or 12,880µS (12.88mS) (High).

1. Fill a sample cup to 20 mL line with the 12,880 µs conductivity standard (6317).

   NOTE: The meter allows for a 1, 2, or 3 point calibration. If calibration is done for more than one point, the lowest concentration should be done first to obtain the best accuracy. Calibrate the ranges from low to high.
2. Press the **ON/OFF** button to turn the TRACER on. Insert the electrode into the standard. Tap or stir the sample with the Tracer to dislodge air bubbles.
3. Press and hold the **CAL/RECALL** button for approximately 2 seconds until the display begins to flash.
4. The meter will automatically recognize and calibrate to the conductivity standard. The display will briefly indicate "SA" and "End" and then return to the measurement mode.

   NOTE: "SA" will not appear if the calibration fails.
5. The calibration range indicator will appear on the display for each range that is calibrated during a power on cycle.

   Ⓗ High Range, 12.88 mS/cm (12,880 µS/cm)

TDS

CHANGING THE MEASUREMENT FUNCTION

The meter can be set to measure Conductivity, pH, Salinity (ppm), TDS (ppm), or TDS (mg/L). To change the mode:

1. Press the **ON/OFF** button to turn the TRACER ON.
2. Press and hold the **MODE/HOLD** button for 2 seconds. The display will begin to scroll through the units.
   µS or mS (Conductivity)
   pH
   ppm S or ppt S (Salinity)
   ppm or ppt (TDS)
   mg/L (TDS)

   NOTE: 1 part per thousand (ppt) equals 1000 parts per million (ppm).
   Example: 3.1 ppt = 3,100 ppm
3. Release the **MODE/HOLD** key when the desired mode is displayed.

   NOTE: The "HOLD" function cannot be used when changing the measurement function. If "HOLD" is displayed in the lower left corner of the display, briefly press the **MODE/HOLD** button to turn it off.

MEASUREMENT

1. For small samples fill a sample cup to the 20 mL line with the test sample. Sample depth must be greater than or equal to 1.5 inches.
2. Press the **ON/OFF** button. (8888 and then "SELF CAL" will appear in the display during the initial diagnostics).
3. Press and hold the **MODE/HOLD** button to scroll to the µs or ms mode.
4. Immerse the TRACER electrode in the sample. Make sure the electrode is completely submersed.
5. Slowly stir the sample with the TRACER to remove air bubbles.
6. The meter will automatically auto-range to the proper range and then display the reading. The display will flash "0000" while auto-ranging.
7. Rinse the electrode in distilled water. Replace the cap.

DISSOLVED OXYGEN

Dissolved oxygen can have both a positive and negative impact on beer, depending on the brewing stage. While fermentation itself is an anaerobic process (occurs in the absence of air), yeast cells do require oxygen for growth. Excessive DO can lead to rapid fermentations and excessive yeast growth, resulting in higher ester production, giving fruitier flavors. It can also lead to permanent chill haze, increased beer astringency, and an increase in color intensity, largely due to the oxidation of polyphenols.

DISSOLVED OXYGEN · TRACER · 1761

For complete instructions, see the Dissolved Oxygen Tracer manual.

FILLING THE ELECTRODE

The electrode is shipped dry and requires filling with the supplied electrolyte solution before the first use. The membrane should be in place and does not need to be replaced. Follow the procedure on page 9 of the DO Tracer manual for filling the membrane cap.

POLARIZATION

If the meter has not been used for seven (7) days or longer the electrode will not be fully polarized. A fully polarized electrode is indicated by a small, flashing, asterisk in the lower right corner of the display when the meter is OFF. If the asterisk is absent, turn the meter ON and allow the electrode to fully polarize. This may take 2-3 minutes. The asterisk will appear to indicate full polarization.

CALIBRATION

Calibration should be performed daily. (Be sure the electrode is filled and fully polarized before calibrating)

1. Press the **ON/OFF** button to turn the TRACER ON.
2. Press and hold **MODE** until '%' is displayed.
3. Remove the electrode cap. The electrode membrane must be clean and dry or the calibration will be incorrect. Do not touch the membrane. Skin oil will affect the electrode response.
4. Moisten the sponge in the electrode cap with distilled water or tap water. Do not soak the sponge.
5. Replace the electrode cap on the electrode. There must be an air gap between the membrane and the sponge.
6. Wait until the reading stabilizes. Press and hold **CAL** until 'CAL' is shown on the display. The readings will blink '101.7' and 'SA' will appear. 'SA' will not appear if the calibration fails.
7. When the calibration is complete 'End' will appear and the meter will return to the measurement mode.

MEASUREMENT

(Be sure the electrode is filled and fully polarized. Calibrate daily.)

1. Cover the electrode with the electrode cap. The sponge in the electrode cap should be moistened (not soaked) with distilled water or tap water.
2. Press **ON/OFF** to turn the meter ON. The meter will self calibrate.

DISSOLVED OXYGEN

3. Press and hold **MODE** to select the desired unit of measure.
4. Remove the electrode cap.
5. Place the electrode in the sample to be measured. Stir the sample with the electrode.
6. Wait for the reading to stabilize.
7. Press **ON/OFF** to turn the meter OFF. Rinse the electrode with distilled water or tap water. Replace the electrode cap.

Test Results

Chloride	_____	ppm
Sulfate	_____	ppm
Alkalinity	_____	ppm
Total Hardness	_____	ppm
Calcium Hardness	_____	ppm
Magnesium Hardness (by calculation)	_____	ppm
Sodium (by calculation)	_____	ppm
pH	_____	
Temperature	_____	°F
Total Dissolved Solids	_____	ppm
Dissolved Oxygen	_____	% / ppm

Plug your test results into the Brewing Water Adjustment Calculator at ***www.lamotte.com/brewlab*** to brew your best batch!

BREWLAB® TIPS

If you want to use any of the on-line brew calculators out there, (one such calculator is **www.brewersfriend.com/water-chemistry** which is referenced on the back page of the BrewLab® manual) you may find that they are set up by chemical symbols or they ask for test results that don't correlate directly to the tests in the BrewLab® kit. Here are some definitions and conversions that may help:

Ca^{+2} = Calcium (In the BrewLab® kit this is expressed as $CaCO_3$, see conversion below)
Mg^{+2} = Magnesium (the BrewLab® kit this is expressed as $CaCO_3$, see conversion below)
SO_4^{-2} = Sulfate
Na^{+} = Sodium
Cl^{-} = Chloride
HCO_3^{-} = Bicarbonate (This is the primary contributor to alkalinity, in the BrewLab® kit it is expressed as Calcium Carbonate ($CaCO_3$) so a conversion is needed for HCO_3, see below)
Fe = Iron (No test for this is included in the BrewLab® kit)

Conversions:
To convert the calcium hardness (as $CaCO_3$) from your BrewLab® to calcium (Ca^{+2}), multiply the result by 0.4.
To convert the magnesium hardness (as $CaCO^3$) from your BrewLab® to magnesium (Mg^{+2}), multiply the result by 0.24.
To convert the alkalinity (as $CaCO_3$) from your BrewLab® to bicarbonate (HCO_3), multiply the result by 1.22.

"People often ask me for advice on brewing water, and the most common question is *what's the first thing I should do?* A great brewer, like a great chef, understands how the ingredients will affect the brewing process and its results. The first step to understanding the effect of water on brewing a great beer is to know what is in it. The **Brewlab® Basic** and **Brewlab® Plus** from the **LaMotte Company** are economical, easy-to-use test kits to quickly measure the mineral content of water and allow the brewer to make informed decisions in the brewing process. Great beer starts with a knowledgeable brewer."

John Palmer, author of *How To Brew*, *Brewing Classic Styles* and *Water, A Comprehensive Guide for Brewers*.

Brewing Resources

To use John Palmer's Brewing Water Adjustment Calculator, and for further tips and information, go to www.lamotte.com/brewlab and select the instructions/tips tab.

How To:

How to Brew by John Palmer
(Brewers Publications, 2006) The home brewing process laid out, step by step. Excerpts available at www.howtobrew.com

Water - A Comprehensive Guide for Brewers by John Palmer and Colin Kaminski
(Brewers Publications, 2013) Water use and adjustment in the brewery from beginning to end.

Organizations:

American Homebrewers Association — An organization supporting home brewers
www.homebrewersassociation.org

Brewers Association — The association for brewers' world wide
www.brewersassociation.org

American Society of Brewing Chemists — Experts in the chemistry of brewing
www.asbcnet.org

Events:

Craft Brewers Conference — An annual event for the craft brewing industry
www.craftbrewersconference.org

National Homebrewers Conference — A conference dedicated to the home brew enthusiast
www.ahaconference.org

LaMotte
Helping People Solve Analytical Challenges
Chestertown · Maryland · 21620 · USA
800-344-3100 · +1 410-778-3100 (Outside USA)
Visit us on the web at www.lamotte.com