



How to Use a Refractometer

What Is A Refractometer?

A refractometer is a relatively inexpensive yet essential piece of test equipment used to determine the sugar content in a liquid, in this case your beer wort. The rugged exterior of metal, rubber and plastic protects the highly polished optical glass, mirrors and prisms that are contained within. Once the sample is in place underneath the daylight plate, the brewer can see the percentage Brix reading by looking through the monocular / eyepiece and reading the scale that is seen when the refractometer is held toward natural light.



What Does A Refractometer Do, and How Does It Work?

In simplest terms, the refractometer works much like a prism, it reacts differently to light (by giving a reading on a scale) depending upon the amount of sugar that is available in the liquid sample held between the daylight plate and the main prism assembly.

As previously stated, a refractometer allows the brewer to figure the percentage BRIX (the relative "sugar weight" of a sample compared to distilled water) of the beer wort. The term BRIX is interchangeable with BALLING or PLATO. The conversion to SPECIFIC GRAVITY is known in brewing circles as "The Rule of 4". By multiplying whatever number your reading is in BRIX x 4 equals your rough SG conversion (1.0xx). For example: a reading of 9 BRIX = 1.036

The Rule Of 4 gives a "rough" conversion from BRIX, at higher gravities the difference in decimal points adds up and will throw the exact conversion off a little bit. the chart below gives the exact conversion. A [standard BRIX refractometer](#) is relatively accurate for brewing standards but it does not display SG scale. traditional SG refractometers display both BRIX and SG but do not read accurate SG at higher sugar concentrations.

BRIX	SPECIFIC GRAVITY
1	1.004
2	1.008
3	1.012
4	1.016
5	1.020
6	1.024
7	1.028
8	1.032
9	1.036
10	1.040

11	1.044
12	1.049
13	1.053
14	1.057
15	1.061
16	1.065
17	1.070
18	1.074
19	1.079
20	1.083
21	1.088
22	1.092
23	1.097
24	1.101
25	1.106
26	1.111
27	1.115
28	1.120
29	1.125
30	1.129
31	1.134
32	1.139

How to Calibrate and Use Your Refractometer

Before you start taking readings, it's very important to calibrate the refractometer. Our Refractometers require the use of distilled water for accurate calibration



Begin the calibration of your refractometer by lifting up the daylight plate and placing 2-3 drops of distilled water on top of the prism assembly. Close the daylight plate so the water spreads across the entire surface of the prism without any air bubbles or dry spots.

Allow the test sample to sit on the prism for approximately 15 seconds before you attempt calibration in the next step. This allows the sample to adjust to the ambient temperature of the refractometer.



Hold the refractometer in the direction of a natural light source and look into the eyepiece. You will see a circular field with graduations down the center. You may have to focus the eyepiece to clearly see the graduations. Figure 1 (below) shows what you would see if you looked through the refractometer without any sample present.



Turn the calibration screw (see photo at left) until the boundary between the upper blue field and the lower white field meet exactly at ZERO on the scale.

See example (Figure 2, shown below) of the interior view you'll see when you look through the eyepiece of the refractometer.

FIGURE 1

The image to the left illustrates what the winemaker would see if he looked through the refractometer without any sample at all.

Notice how the entire scale is colored blue; no white at all.

When looking through the monocular, be sure



you are using natural light to view the readings; you should not read a refractometer in the presence of fluorescent light.

FIGURE 2

This is what you will see with a sample of distilled water through a properly calibrated refractometer.



Notice that the reading is taken where the blue and the white meet. Calibrate to ZERO using distilled water as the sample.

FIGURE 3

Finally, we get to sample some actual Wort! Readings can be taken from unfermented wort at any stage in the brewing process from mashing through boiling, anything PRE-FERMENTATION

As you can see from this sample of Barleywine the reading is 23% Brix. This can be quick converted using the rule of 4 to 1.092 or exactly with the chart to 1.097.

The SG scale on the Brewfractometer will accurately display the 23 = 1.097.

Be sure to cleanse and dry the refractometer before putting it away in storage.

When to use your refractometer.

A refractometer is most useful to a brewer for taking quick readings of wort samples in situations where it is not practical to take and cool a large sample for a hydrometer reading. Instead a small sample of a few drops can be taken and quickly cooled on the instrument to get an accurate "quick read". For example:

Monitor Gravity of wort runnings coming out of the mash tun. Early runnings from a mash will typically be very high in the 20-22 range, as more wort is extracted from the mash tun the strength of runnings will decline. It is recommended to not extract runnings that register lower than 3 BRIX or 1.012 to prevent extracting excessive tannins and other undesirable flavors from the grain.

Monitor Gravity of wort in the boil. Wort becomes progressively more concentrated as water is boiled away, it is helpful to know what the gravity is as you boil in case you need to add water to dilute a gravity that is too high, or boil longer to achieve a higher target gravity.

A Refractometer will not give an accurate reading after fermentation has begun. Once alcohol is present in the liquid a mathematical correction must be applied, The formula is displayed below, [Here is a link to an online calculator.](#) For this reason it may be helpful to stick with the good 'ol hydrometer for pre-and post ferment readings until you are confident in your refractometer readings.

Formula for compensation of ethanol effect on refractometer:

$$SG=1.001843-0.002318474(OB)-0.000007775(OB^2)-0.000000034(OB^3)+0.00574(AB) +0.00003344(AB^2)+0.000000086(AB^3)$$

SG = Specific Gravity, OB = Original Brix, AB = Actual Brix (Brix Readings During Fermentation)

Warnings and Maintenance of Your Refractometer

Accurate measurement depends on careful calibration. Follow the instructions above closely. A *reminder*: Differences between the ambient room temperature of the prism and the temperature of the sample will throw off the accuracy of your reading. Remember to allow the sample to rest on the prism assembly for 30 seconds before taking a reading.

Do not expose the refractometer to damp working conditions. Do not immerse the instrument in water. If the instrument becomes foggy, water has entered the body. Call a qualified service technician or contact your dealer to purchase a new refractometer.

Do not measure abrasive or corrosive chemicals with this instrument, because they can damage the prism's coating.