



Analytical Instruments

Using Light to Measure Concentration



Principles of Operation and Applications for VEE GEE Refractometers

VEE GEE Refractometers have achieved acclaim all over the world for their simplicity and accuracy. With only a few drops of a liquid sample, any user can easily measure the concentration of a dissolved solid. This ease of operation increases efficiency and productivity, and their versatility has carved a deep niche in a diverse group of markets.

The Principal of Refraction

If an object, such as a pencil or bar is placed in water it will appear to bend (figure 1). Since light bends when it enters a solution, it creates the effect that the object is bending. This phenomenon is known as the refraction of light. The more concentrated a solution is with dissolved solids, the more the object will appear to bend (figure 2).

The degree to which the light bends is known as the angle of refraction. An index value has been established for each of these angles of refraction, and this "refractive index" (nD) can be used to either identify or evaluate a given liquid sample.

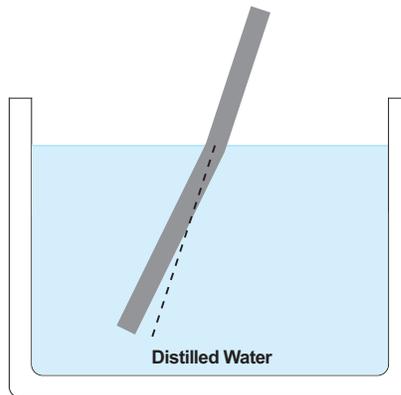


Figure 1

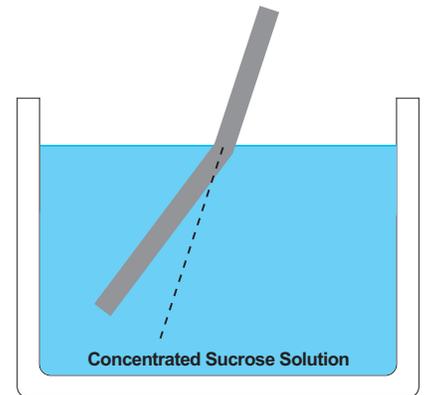
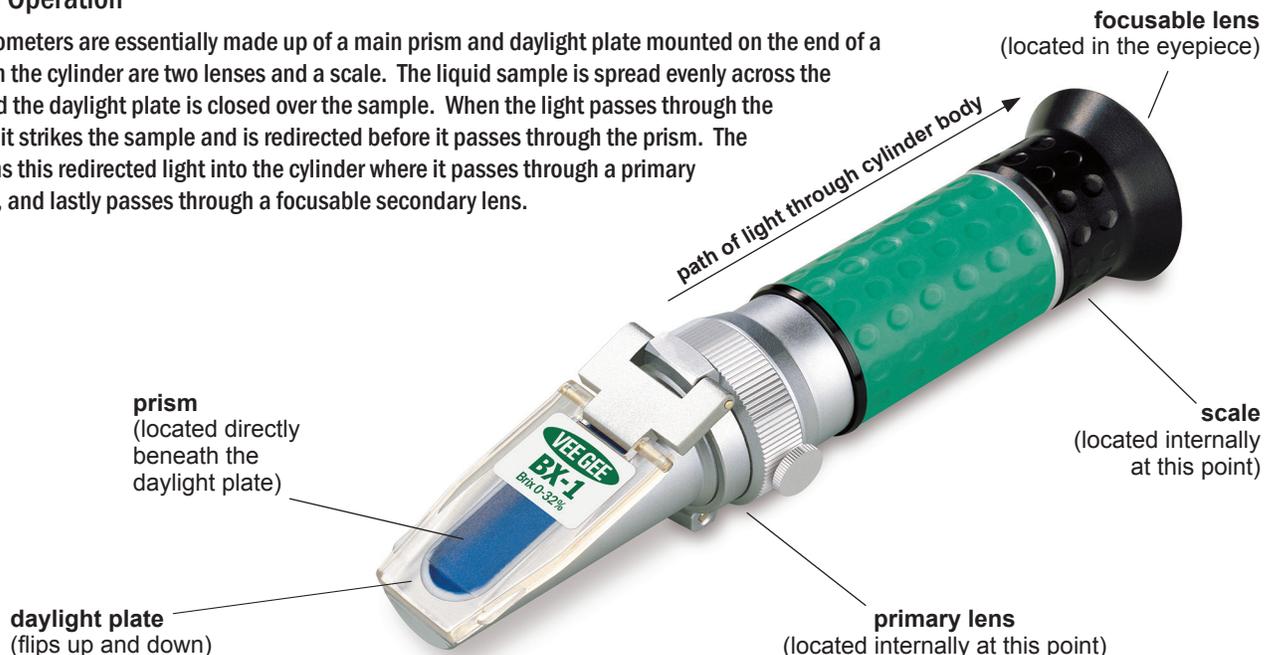


Figure 2

Principles of Operation

Analog refractometers are essentially made up of a main prism and daylight plate mounted on the end of a cylinder. Within the cylinder are two lenses and a scale. The liquid sample is spread evenly across the main prism and the daylight plate is closed over the sample. When the light passes through the daylight plate, it strikes the sample and is redirected before it passes through the prism. The prism then aims this redirected light into the cylinder where it passes through a primary lens, the scale, and lastly passes through a focusable secondary lens.



Measuring Samples With The Refractometer

NOTE: The following instructions apply to analog refractometers only. If using a digital model, simply record measurements from the LCD display for use in Step 4.

1 Place 2-3 drops of the sample on the prism and close the daylight plate to spread the liquid evenly across the prism.

Prism
(located directly under the daylight plate)

Daylight Plate
(flip up to place sample on prism)

2 Make sure that the sample covers the entire surface of the prism without any air pockets.

PRISM FULLY COVERED
YES

PRISM PARTIALLY COVERED
NO

AIR POCKETS & GAPS ON PRISM
NO

3 Hold the prism towards a light source while looking through the eyepiece; the reading is taken where the upper blue and lower white fields meet on the scale.

Scale

Blue Field

White Field

Point Of Reading

Brix%

20°C

4 If necessary, convert the measurement from the instruments native scale to a reading more suited for your application.

In order to perform a conversion from the native scale reading of the instrument the use of a translation table or formula will be necessary. There are many readily available tables and formulas for common translations.

To translate to a less common, or a unique scale, it will be necessary to create a custom table by taking readings of samples with known values and making note of their corresponding native scale readings.

Brix Reading	Translated Reading
0%	0%
5%	7.5%
10%	15%
20%	30%
40%	60%

Note: This table is only a sample.