CONTENTS

HANNA Digital Refractometers

Introduction

Refractometry

Refractometry is the method of measuring a substances refractive index (one of their fundamental physical properties) in order to assess their composition or purity.

The refractive index of a substance is strongly influenced by temperature and the wavelength of light used to measure it, therefore, care must be taken to control or compensate for temperature differences and wavelength. The refractive index measurements are usually reported at a reference temperature of 20 degrees Celsius, which is equal to 68 degrees Fahrenheit, and considered to be room temperature.

A digital refractometer is an instrument used to measure the refractive index and to convert/compensate this information in specific units (depending by model).

Refractive Index

Determinations are made by measuring the refractive index of a solution. Refractive Index is an optical characteristic of a substance and the number of dissolved particles in it.

Refractive Index is defined as the ratio of the speed of light in empty space to the speed of light in the substance. A result of this property is that light will "bend", or change direction, when it travels through a substance of different refractive index. This is called refraction.

When passing from a material with a higher to lower refractive index, there is a critical angle at which an incoming beam of light can no longer refract, but will instead be reflected off the interface.

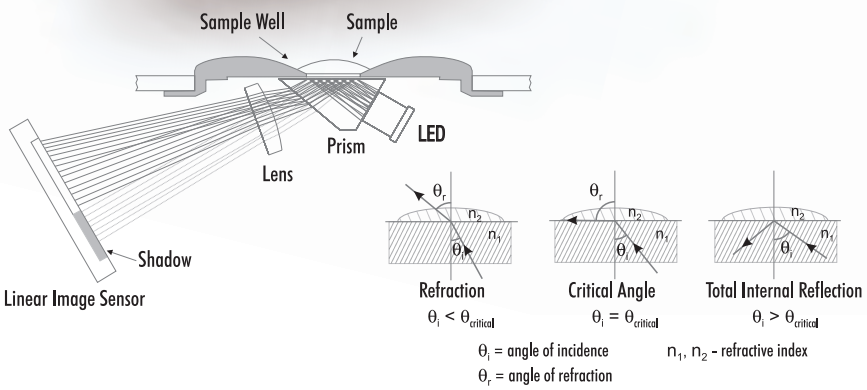
The critical angle can be used to easily calculate the refractive index according to the equation:

$$\sin(\theta_{critical}) = n_2 / n_1$$

Where n_2 is the refractive index of the lower-density medium; n_1 is the refractive index of the higher-density medium.

Light from an LED passes through a prism in contact with the sample.

An image sensor determines the critical angle at which the light is no longer refracted through the sample. Specialized algorithms then apply temperature compensation to the measurement and convert the refractive index to the specified parameter.



- **Automatic Temperature Compensation**
  For exceptionally accurate measurements
- **Easy measurement**
  Place a few drops of the sample in the well and press the READ key
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings.
- **IP65 water protection**
  Built to perform under harsh laboratory and field conditions.
- **Single point calibration**
  Calibrate with distilled or deionized water
- **Small sample size**
  Sample size can be as small as 2 metric drops.
- **Stainless steel sample well**
  Easy to clean and corrosion resistant
- **ABS thermoplastic casing**
- **Start-up**
  When powered on the meter displays battery life and the set measurement units.
- **Unit selection**
  Pressing the RANGE key quickly cycles through the units of measurement (if applicable).
- **Calibration**
  Perform a quick and easy calibration after start-up with distilled or deionized water.

Battery life on display


Easy to clean stainless steel sample well

Easy measurement

HANNA instruments

With Great Products, Come Great Results™

HI 96801

Digital Refractometer for Analysis of Sugar in Food, Sucrose Measurement

13.6

HANNA offers four sugar refractometers to meet the requirements of the food industry. The HI 96801 refractometer measures the refractive index to determine the % Brix of sugar in aqueous solutions. The refractive index of the sample is converted to % Brix concentration units. Temperature (in °C or °F) is displayed simultaneously with the measurement on the large dual level display along with icons for low power and other helpful messages

HI 96811

Digital Refractometer for Measurement of Sugar in Wine

13.4

HANNA offers five wine refractometers to meet the requirements of cultural differences found throughout the wine industry. HI 96811, converts the refractive index of the sample to sucrose concentration in units of percent by weight, %Brix (also referred to as °Brix). The conversion used is based on the ICUMSA Methods Book (International Commission for Uniform Methods of Sugar Analysis). Since the majority of sugar in grape juice is fructose and glucose and not sucrose, the reading is sometimes referred to as "Apparent Brix".

HI 96822

Digital Refractometer for Natural or Artificial Seawater Analysis

13.10

HANNA's HI 96822 Digital Refractometer is a rugged, portable, water resistant device that utilizes the measurement of the refractive index to determine the salinity of natural and artificial seawater, ocean water or brackish intermediates. The HI 96822 reflects HANNA's years of experience as a manufacturer of analytical instruments. This digital refractometer eliminates the uncertainty associated with mechanical refractometers and is durable and compact enough to be used at home, in the lab and out in the field.

HI 96811 • HI 96812 • HI 96813 • HI 96814 • HI 96816

Digital Refractometers for Measurement of Sugar in Wine

- **Dual-level LCD**
  The dual-level LCD displays measurement and temperature readings simultaneously
- **Automatic Temperature Compensation**
  For accurate measurements
- **Easy measurement**
  Place a few drops of the sample in the well and press the READ key
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings.
- **IP65 water protection**
  Built to perform under harsh laboratory and field conditions.
- **Quick, accurate results**
  Readings are displayed in approximately 1.5 seconds.
- **Single point calibration**
  Calibrate with distilled or deionized water
- **Small sample size**
  Sample size can be as small as 2 metric drops.
- **Automatic shut-off**
  After three minutes of non-use
- **Stainless steel sample well**
  Easy to clean and corrosion resistant
- **ABS thermoplastic casing**

HANNA offers five wine refractometers to meet the requirements of cultural differences found throughout the wine industry. The HI 96811, HI 96812, HI 96813, HI 96814 and HI 96816 Digital Wine Refractometers are rugged, lightweight and waterproof for measurements in the lab or field. Each instrument offers a different but valid way to measure the density of grape must and other sugar based liquids.

These optical instruments employ the measurement of the refractive index to determine parameters pertinent to the wine industry.

The actual measurement of the refractive index is simple and quick and provides the vintner a standard accepted method for sugar content analysis. Samples are measured after a simple user calibration with deionized or distilled water. Within seconds, the instrument measures the refractive index of the grape must. These digital refractometers eliminate the uncertainty associated with mechanical refractometers and are ideal for fast, reliable measurements in the field.

HI 96811, **HI 96813** and **HI 96814** convert the refractive index of the sample to sucrose concentration in units of percent by weight, %Brix (also referred to as °Brix). The conversion used is based on the ICUMSA Methods Book (International Commission for Uniform Methods of Sugar Analysis). Since the majority of sugar in grape juice is fructose and glucose and not sucrose, the reading is sometimes referred to as "Apparent Brix".

HI 96812 has units of °Baumé. The °Baumé scale is based on density and was originally designed to measure the mass of sodium chloride in water. °Baumé is used in wine making to measure the sugar in must. The HI 96812 converts the %Brix reading to °Baumé based on the table found in the Official Methods of Analysis of AOAC International, 18th Edition. 1 °Baumé is approximately equal to 1.8 %Brix, and 1 °Baumé is roughly equivalent to 1 % alcohol when the wine is fully fermented.

In addition to %Brix, HI 96814 includes two other scales used in the wine industry: °Oechsle and °KMW.

°Oechsle (°Oe) is mainly used in the German, Swiss and Luxenburgish winemaking industry to measure the sugar content of must. The °Oe scale is based on specific gravity at 20°C (SG20/20) and is the first 3 digits following the decimal point. 1 °Oe is roughly equal to 0.2 %Brix.

°Oe = [(SG20/20) - 1] x 1000

°Klosterneuburger Mostwaage (°KMW) is used in Austria to measure the sugar content of must.

°KMW is related to °Oe by the following equation: °Oe = °KMW x [(0.022 x °KMW) + 4.54]

1 °KMW is roughly equivalent to 1 %Brix or 5 °Oe. °KMW is also known as °Babo.

"Potential" or "probable" alcohol is an estimation of the alcohol content (% vol/vol) in finished wine based on the conversion between sugar and alcohol. This conversion depends on many factors such as the type of grapes, the grape maturity, the growing region and yeast fermentation efficiency and temperature.

The **HI 96813** allows the user to tailor the instrument to their specific needs based on their experience, since no fixed conversion factor is universally applicable. The first conversion is based on the %Brix value and an adjustable conversion factor between 0.50 and 0.70 (0.55 is a common value).

Potential alcohol (% v/v) = (0.50 to 0.70) x % Brix

One drawback of the above equation is that it does not take into account the nonfermentable sugars and extract.

A second equation was also added that takes these factors into account and can give a more accurate estimate of the alcohol content in the finished wine. This conversion is named "C1" on the meter, and uses the following equation:

Potential Alcohol (%v/v) = 0.059 x [(2.66 x °Oe) - 30] (C1)

The **HI 96816** potential alcohol curve is based on the tables found in the European Economic Community Commission Regulation No 2676/90 of September 17, 1990, Determining Community Methods for the Analysis of Wine and International Organization of Vine and Wine (OIV). The potential alcohol curve is based on the following equation:

Potential alcohol (%v/v) = g/L of Sugar / 16.83

SPECIFICATIONS		HI 96811	HI 96812	HI 96813	HI 96814	HI 96816
Range	**Sugar Content**	0 to 50 % Brix	0 to 27 °Baumé	0 to 50 % Brix; 0.0-25.0 % V/V Potential Alcohol	0 to 50 % Brix; 0-230° Oechsle; 0-42° KMW	4.9 to 56.8 %v/v Potential Alcohol (10 to 75 %Brix)
	Temperature			0 to 80°C (32 to 176°F)		
Resolution	**Sugar Content**	0.1 % Brix	0.1 °Baumé	0.1 % Brix; 0.1 % V/V Potential Alcohol	0.1 % Brix; 1° Oechsle 0.1° KMW	0.1 %v/v
	Temperature			±0.1°C (0.1°F)		
Accuracy (@20°C/68°F)	**Sugar Content**	±0.2 % Brix	±0.1 °Baumé	±0.1 °Baumé; ±0.2 V/V Potential Alcohol	±0.2 % Brix; ±1° Oechsle ±0.1° KMW	±0.2 %v/v
	Temperature			±0.3°C (0.5°F)		
Temperature Compensation		automatic between 10 and 40°C (50 to 104°F)				
Measurement Time		approximately 1.5 seconds				
Minimum Sample Volume		100 µL (to cover prism totally)				
Light Source		yellow LED				
Sample Cell		stainless steel ring and flint glass prism				
Auto-off		after three minutes of non-use				
Enclosure Rating		IP65				
Battery Type / Battery Life		9V / approximately 5000 readings				
Dimensions / Weight		192 x 104 x 69 mm (7.6 x 4.1 x 2.7") / 420 g (14.8 oz.)				

ORDERING INFORMATION

HI 96811, **HI 96812**, **HI 96813**, **HI 96814** and **HI 96816** are supplied with battery and instruction manual.

HI 96801 • HI 96802 • HI 96803 • HI 96804

Digital Refractometers for Sugar Analysis Throughout the Food Industry

- **Ideal for the analysis of:**
  fruits, energy drinks, puddings, soy milk juices, jam, marmalade, honey, soups, jelly, tofu and condiments
- **Dual-level LCD**
  The dual-level LCD displays measurement and temperature readings simultaneously
- **Automatic Temperature Compensation**
  For accurate measurements
- **Easy measurement**
  Place a few drops of the sample in the well and press the READ key
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings.
- **IP65 water protection**
  Built to perform under harsh laboratory and field conditions.
- **Quick, accurate results**
  Readings are displayed in approximately 1.5 seconds.
- **Single point calibration**
  Calibrate with distilled or deionized water
- **Small sample size**
  Sample size can be as small as 2 metric drops.
- **Automatic shut-off**
  After three minutes of non-use
- **Stainless steel sample well**
  Easy to clean and corrosion resistant
- **ABS thermoplastic casing**

HANNA offers four sugar refractometers to meet the requirements of the food industry. The HI 96801 Sucrose, HI 96802 Fructose, HI 96803 Glucose and HI 96804 Invert Sugar digital refractometers are rugged, portable and water resistant for measurements in the lab or field. Each instrument offers a specific analysis to determine accurate sugar concentration.

These optical instruments employ the measurement of the refractive index to determine parameters pertinent for sugar concentration analysis.

The actual measurement of refractive index is simple and quick and provides the operator a standard accepted method for sugar content analysis. Samples are measured after a simple user calibration with deionized or distilled water. Within seconds these instruments measure the refractive index of the sample and convert it to percent by weight concentration units (or %Brix for HI 96801). These digital refractometers eliminate the uncertainty associated with mechanical refractometers and are easily portable for measurements in the field.

These four instruments utilize internationally recognized references for unit conversion and temperature compensation and employ methodology recommended in the ICUMSA Methods Book (internationally recognized body for sugar analysis).

Temperature (in °C or °F) is displayed simultaneously with the measurement on the large dual level display along with icons for low power and other helpful messages.

HI 96801

Measures the refractive index to determine the % Brix of sugar in aqueous solutions. The refractive index of the sample is converted to % Brix concentration units.

HI 96802

Measures the refractive index to determine the % fructose in aqueous solutions. The refractive index of the sample is converted to % by weight concentration units.

HI 96803

Measures the refractive index to determine the % glucose in aqueous solutions. The refractive index of the sample is converted to % by weight concentration units.

HI 96804

Measures the refractive index to determine the % invert sugar in aqueous solutions. The refractive index of the sample is converted to % by weight concentration units.

SPECIFICATIONS		HI 96801	HI 96802	HI 96803	HI 96804
Range	Sugar Content	0 to 85% Brix (% Brix)	0 to 85% (by weight) (% fructose)	0 to 85% (by weight) (% glucose)	0 to 85% (by weight) (% invert sugar)
	Temperature	0 to 80°C (32 to 176°F)			
Resolution	Sugar Content	0.1 % Brix	0.1	0.1	0.1
	Temperature	0.1°C (0.1°F)			
Accuracy (@20°C/68°F)	Sugar Content	±0.2% Brix	±0.2%	±0.2%	±0.2%
	Temperature	0.3°C (0.5°F)			
Temperature Compensation		automatic between 10 and 40°C (50 to 104°F)			
Measurement Time		approximately 1.5 seconds			
Minimum Sample Volume		100 µL (to cover prism totally)			
Light Source		yellow LED			
Sample Cell		stainless steel ring and flint glass prism			
Auto-off		after three minutes of non-use			
Enclosure Rating		IP65			
Battery Type / Battery Life		9V / approximately 5000 readings			
Dimensions / Weight		192 x 104 x 69 mm (7.6 x 4.1 x 2.7") / 420 g (14.8 oz.)			

Making a standard % Brix solution

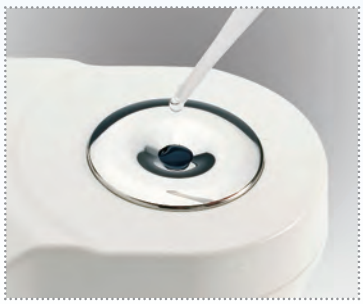
To make a Brix Solution, follow the procedure below:

- Place container (such as a glass vial or dropper bottle that has a cover) on an analytical balance.
- Tare the balance.
- To make an X BRIX solution weigh out X grams of high purity sucrose (CAS #: 57-50-1) directly into the container.
- Add distilled or deionized water to the container so the total weight of the solution is 100 g.

Note: Solutions above 60 %Brix need to be vigorously stirred or shaken and heated in a water bath. Remove solution from bath when sucrose has dissolved. The total quantity can be scaled proportionally for smaller containers but accuracy may be sacrificed.

Example with 25 %Brix:

% Brix	25
g Sucrose	25.000
g Water	75.000
g Total	100.000



ORDERING INFORMATION

HI 96801, **HI 96802**, **HI 96803** and **HI 96804** are supplied with battery and instruction manual.

HI 96821

Digital Refractometer for Sodium Chloride Measurement for the Food Industry

- **Ideal for the analysis of:**
  Salad Dressings, Cheeses, Condiments, Pickles, Canned Foods, Jarred Foods, Milk, Juices, Energy Drinks, Soups, Brines and Whey
- **Dual-level LCD**
  The dual-level LCD displays measurement and temperature readings simultaneously
- **Automatic Temperature Compensation**
  For accurate measurements
- **Easy measurement**
  Place a few drops of the sample in the well and press the READ key
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings.
- **IP65 water protection**
  Built to perform under harsh laboratory and field conditions.
- **Quick, accurate results**
  Readings are displayed in approximately 1.5 seconds.
- **Single point calibration**
  Calibrate with distilled or deionized water
- **Small sample size**
  Sample size can be as small as 2 metric drops.
- **Automatic shut-off**
  After three minutes of non-use
- **Stainless steel sample well**
  Easy to clean and corrosion resistant
- **ABS thermoplastic casing**

HANNA offers the HI 96821 digital sodium chloride refractometer to meet the requirements of the food industry. This optical instrument employs the measurement of the refractive index to determine sodium chloride concentration in aqueous solutions used in food preparation. It is not intended for sea water salinity measurements.

The measurement of refractive index is simple and quick and provides the user an accepted method for NaCl analysis. Samples are measured after a simple user calibration with deionized or distilled water. Within seconds the instrument measures the refractive index of the solution. The digital refractometer eliminates the uncertainty associated with mechanical refractometers and is portable for measurements where you need them.

The instrument utilizes internationally recognized references for unit conversion and temperature compensation. It can display the measurement of NaCl concentration 4 different ways: g/100 g, g/100 mL, specific gravity, and °Baumé.

Temperature (in °C or °F) is displayed simultaneously with the measurement (on 3 of the ranges) on the large dual level display along with icons for Low Power and other helpful message codes.

Easy Operation

Start-up screens

When the HI 96821 is turned on, test screens then the percentage of battery life remaining is shown on the LCD followed by the ready status.

Unit selection

Just press the RANGE key to cycle through the HI 96821's units of measurement. g/100 g, g/100 mL, Specific Gravity and °Baumé.

Temperature selection can also be easily changed.

Calibration

Perform a quick and easy calibration after start-up:

1. Using a plastic pipette, completely cover the prism in the sample well with distilled or deionized water.
2. Press the ZERO key

Measurement

Achieve fast, professional results:

1. Using a plastic pipette, drip sample onto the prism surface until the well is full.
2. Press the READ key and the results are display in the selected units.

SPECIFICATIONS		HI 96821
Range	g/100 g	0 to 28
	g/100 mL	0 to 34
	Specific Gravity	1.000 to 1.216
	°Baumé	0 to 26
	Temperature	0 to 80°C (32 to 176°F)
Resolution	g/100 g	0.1
	g/100 mL	0.1
	Specific Gravity	0.001
	°Baumé	0.1
	Temperature	0.1°C (0.1°F)
Accuracy (@20°C/68°F)	g/100 g	±0.2
	g/100 mL	±0.2
	Specific Gravity	±0.002
	°Baumé	±0.2
	Temperature	±0.3°C (0.5°F)
Temperature Compensation		automatic between 10 and 40°C (50 to 104°F)
Measurement Time		approximately 1.5 seconds
Minimum Sample Volume		100 µL (to cover prism totally)
Light Source		yellow LED
Sample Cell		stainless steel ring and flint glass prism
Auto-off		after three minutes of non-use
Enclosure Rating		IP65
Battery Type / Battery Life		9V / approximately 5000 readings
Dimensions / Weight		192 x 104 x 69 mm (7.6 x 4.1 x 2.7") / 420 g (14.8 oz.)

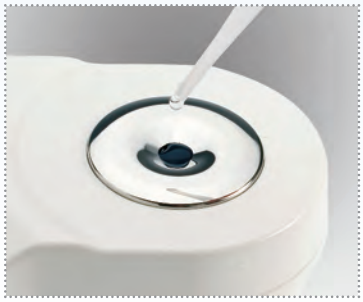
Making a Standard Sodium Chloride Solution

To make a standard NaCl solution (g/100 g), follow the procedure below:

- Place a container (such as a glass vial or dropper bottle that has a cover) on an analytical balance.
- Tare the balance.
- To make an X NaCl solution weigh out X grams of high purity dried Sodium Chloride (CAS #: 7647-14-5: MW 58.44) directly into the container.
- Add distilled or deionized water to the container so the total weight of the solution is 100 g.

Example with g/100 g NaCl:

g/100 g NaCl	10
g NaCl	10.000
g Water	90.000
g Total	100.000



ORDERING INFORMATION

HI 96821 is supplied with battery and instruction manual.

HI 96822

Digital Refractometer for Natural or Artificial Seawater Analysis

- **Dual-level LCD**
  The dual-level LCD displays measurement and temperature readings simultaneously
- **Automatic Temperature Compensation**
  For accurate measurements
- **Easy measurement**
  Place a few drops of the sample in the well and press the READ key
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings.
- **IP65 water protection**
  The HI 96822 is built to perform under the harsh field conditions associated with environments containing seawater.
- **Quick, accurate results**
  Readings are displayed in approximately 1.5 seconds.
- **Single point calibration**
  Calibrate with distilled or deionized water
- **Small sample size**
  Sample size can be as small as 2 metric drops.
- **Automatic shut-off**
  After three minutes of non-use
- **Stainless steel sample well**
  Easy to clean and corrosion resistant
- **ABS thermoplastic casing**

HANNA's HI 96822 Digital Refractometer is a rugged, portable, water resistant device that utilizes the measurement of the refractive index to determine the salinity of natural and artificial seawater, ocean water or brackish intermediates. The HI 96822 reflects HANNA's years of experience as a manufacturer of analytical instruments. This digital refractometer eliminates the uncertainty associated with mechanical refractometers and is durable and compact enough to be used at home, in the lab and out in the field.

The HI 96822 is an optical device that is quick and easy to use. After a simple user calibration with distilled or deionized water, a seawater sample can be introduced into the sample well.

Within seconds, the refractive index and temperature are measured and converted into one of 3 popular measurement units: Practical Salinity Units (PSU), salinity in parts per thousand (ppt), or specific gravity (S.G. (20/20)). All conversion algorithms are based upon respected scientific publications using the physical properties of seawater (not sodium chloride).

The Importance of Salinity Measurement Throughout a Variety of Applications

Salinity is a critical measurement in many applications, such as aquaculture, environmental monitoring, aquariums, desalination plants, well water, and many more. Until now, the available technology to measure salinity has relied on mechanical instruments, such as hydrometers and ocular refractometers, or on high-tech conductivity meters. While easy to use, ocular refractometers can be difficult to get a accurate reading from and are highly susceptible to changes in temperature. Hydrometers, though inexpensive, are clumsy and inaccurate. Conductivity meters that convert to salinity can be cost-prohibitive.

The HANNA HI 96822 is the solution to all these issues. It is lightweight, easy to use, cost-efficient, and is extremely accurate. With the ability to read in all the three of the most widely used salinity units (PSU, ppt, and specific gravity), it is the ideal instrument for any application.

Easy Operation

Start-up screens

When the HI 96821 is turned on, test screens then the percentage of battery life remaining is shown on the LCD followed by the ready status.

Unit selection

Just press the RANGE key to cycle through the HI 96822's units of measurement. PSU, ppt, specific gravity (20/20).

Temperature selection can also be easily changed.

Calibration

Perform a quick and easy calibration after start-up:

1. Using a plastic pipette, completely cover the prism in the sample well with distilled or deionized water.
2. Press the ZERO key

Measurement

Achieve fast, professional results:

1. Using a plastic pipette, drip sample onto the prism surface until the well is full.
2. Press the READ key and the results are display in the selected units.

Making a standard sodium chloride solution

Sodium Chloride solutions can be used to check the accuracy of the meter. The table below lists several Sodium Chloride solutions and there expected ppt Seawater value.

To make a Standard NaCl Solution (g/100 g), follow the procedure for the HI 96821.

	g of NaCl	g of Water	Total Weight	Expected ppt Seawater Value
5% NaCl	5.00	95.00	100.00	48
10% NaCl	10.00	90.00	100.00	96
15% NaCl	15.00	85.00	100.00	145

SPECIFICATIONS		HI 96822
Range	PSU	0 to 50
	ppt	0 to 150
	Specific Gravity (20/20)	1.000 to 1.114
	Temperature	0 to 80°C (32 to 176°F)
Resolution	PSU	1
	ppt	1
	Specific Gravity (20/20)	0.001
	Temperature	0.1°C (0.1°F)
Accuracy (@20°C/68°F)	PSU	±2
	ppt	±2
	Specific Gravity (20/20)	±0.002
	Temperature	±0.3°C (0.5°F)
Temperature Compensation		automatic between 10 and 40°C (50 to 104°F)
Measurement Time		approximately 1.5 seconds
Minimum Sample Volume		100 µL (to cover prism totally)
Light Source		yellow LED
Sample Cell		stainless steel ring and flint glass prism
Auto-off		after three minutes of non-use
Enclosure Rating		IP65
Battery Type / Life		9V / approximately 5000 readings
Dimensions		192 x 104 x 69 mm (7.6 x 4.1 x 2.7") / 420 g (14.8 oz.)
Weight		420 g

Some specific examples of the importance of salinity:

Aquaculture: Young salmon start their lives in fresh water. As they mature, they reach a stage ("smoltification") when the transition to salt water. When farming salmon, it is critically important to maintain proper salinity levels at each life stage to prevent unnecessary stress that could negatively affect growth and development.

Salinity is a vital parameter to monitor accurately when raising eggs and larval fish, optimizing juvenile and adult growth, and culturing live food such as rotifers and artemia.

Aquariums: Whether it is the world renowned, eight million gallon Georgia Aquarium, or a 20 gallon reef tank at home, salinity is a crucial parameter to measure. In closed systems such as these, salinity is easily affected. As water evaporates, it leaves the salt behind, raising the salinity. When evaporated water is replaced with fresh water, the salinity is lowered. The potential for disaster is inherent in both situations. Use HANNA's digital refractometer to accurately measure salinity will help prevent any mishaps.

Environment: Salinity is almost always a required measurement when doing any kind of environmental monitoring or pollution studies. Salinity has the ability to affect many processes, such as respiration, reproduction, and growth development. If monitoring for the effect of pollution, it is important to make sure a salinity variation is not having an additional influence.

Well Water: In coastal areas, the freshwater aquifer (or water table) is adjacent to salt water. This aquifer often supplies the drinking water for the local population. If too many wells are sunk, or too much water is drawn from the aquifer, the water table may sink so low that salt water incursion occurs and the water table has become contaminated.

ORDERING INFORMATION

HI 96822 is supplied with battery and instruction manual.

HI 96831 • HI 96832

Digital Refractometer for Ethylene and Propylene Glycol Analysis

- **Dual-level LCD**
  The dual-level LCD displays measurement and temperature readings simultaneously
  Automatic Temperature Compensation
  For accurate measurements
- **Easy measurement**
  Place a few drops of the sample in the well and press the READ key
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings.
- **IP65 water protection**
  Built to perform under harsh laboratory and field conditions.
- **Quick, accurate results**
  Readings are displayed in approximately 1.5 seconds.
- **Single point calibration**
  Calibrate with distilled or deionized water
- **Small sample size**
  Sample size can be as small as 2 metric drops.
- **Automatic shut-off**
  After three minutes of non-use
- **Stainless steel sample well**
  Resists corrosion from salt water.
- **ABS thermoplastic casing**

The HI 96831 Ethylene Glycol and HI 96832 Propylene Glycol Digital Refractometers are rugged, portable, water resistant devices that utilize the measurement of refractive index to determine the percent volume and freezing point of ethylene or propylene glycol based solutions.

These digital refractometers eliminate the uncertainty associated with mechanical refractometers. HI 96831 and HI 96832 samples are measured after a simple user calibration with distilled or deionized water. Within seconds, the refractive index and temperature are measured and converted into one of two measurement units; % volume or freezing point. These meters use internationally recognized references for unit conversion and temperature compensation for glycol solutions (e.g. CRC Handbook of Chemistry and Physics, 87th Edition).

ORDERING INFORMATION

HI 96831 and **HI 96832** are supplied with battery and instruction manual.

SPECIFICATIONS		HI 96831 Ethylene Glycol	HI 96832 Propylene Glycol
Range	% Volume	0 to 100 %	
	Freezing Point	0 to -50 °C (32 to -58 °F)	0 to -51 °C (32 to -59.8 °F)
	Temperature	0 to 80 °C (32 to 176 °F)	
Resolution	% Volume	0.1 %	
	Freezing Point	0.1 °C (0.1 °F)	
	Temperature	0.1 °C (0.1 °F)	
Accuracy (@20°C/68°F)	% Volume	±0.2 %	
	Freezing Point	±0.5 °C (±1.0 °F)	
	Temperature	±0.3 °C (±0.5 °F)	
Temperature Compensation		automatic between 0 and 40°C (32 to 104°F)	
Measurement Time		approximately 1.5 seconds	
Minimum Sample Volume		100 µL (to cover prism totally)	
Light Source		yellow LED	
Sample Cell		stainless steel ring and flint glass prism	
Auto-off		after three minutes of non-use	
Enclosure Rating		IP65	
Battery Type / Battery Life		9V / approximately 5000 readings	
Dimensions / Weight		192 x 104 x 69 mm (7.6 x 4.1 x 2.7") / 420 g (14.8 oz.)	

HANNA instruments

With Great Products, Come Great Results™