



**NIEUWKOOP**

METEN.NL

# USER MANUAL



## RE1500

REFRACTOMETER DIGITAL

0-85% Brix



TO MEASURE  TO KNOW



## Index

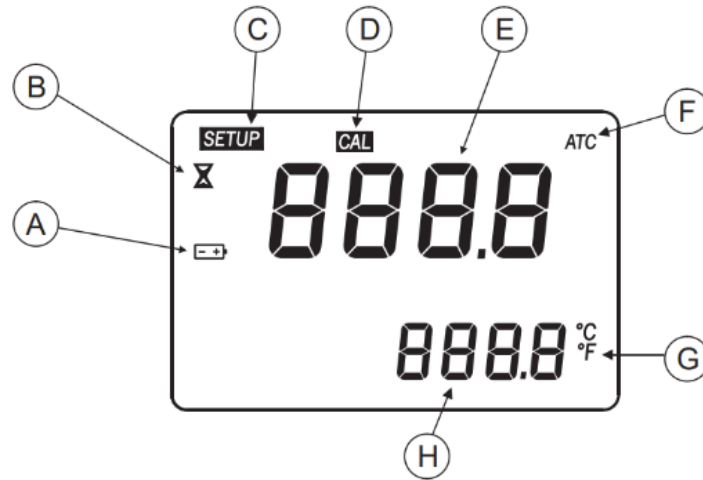
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## FUNCTIONAL DESCRIPTION

### DISPLAY

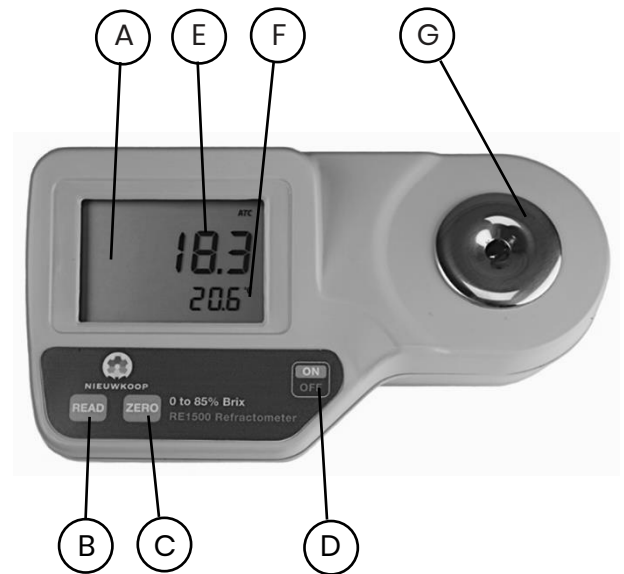


- A. BATTERY STATUS ICON (BLINKS WHEN LOW BATTERY CONDITION DETECTED)
- B. MEASUREMENT IN PROGRESS TAG
- C. SETUP: FACTORY CALIBRATION TAG
- D. CAL: CALIBRATION TAG
- E. PRIMARY DISPLAY (DISPLAYS MEASUREMENT AND ERROR MESSAGES)
- F. AUTOMATIC TEMPERATURE COMPENSATION (BLINKS WHEN TEMPERATURE EXCEEDS 10-40 °C/  
50-104 °F RANGE) TEMPERATURE UNITS
- G. TEMPERATURE UNIT
- H. SECONDARY DISPLAY (DISPLAYS TEMPERATURE MEASUREMENTS; WHEN BLINKING, TEMPERATURE  
HAS EXCEEDED OPERATION RANGE: 0-80 °C / 32-176 °F)



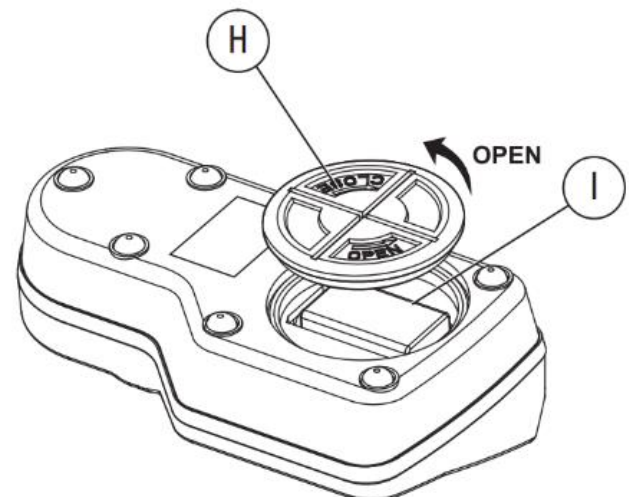
## FRONT PANEL

- A. LIQUID CRYSTAL DISPLAY (LCD)
- B. READ KEY (USER MEASUREMENT)
- C. ZERO KEY (USER CALIBRATION)
- D. ON/OFF
- E. PRIMARY DISPLAY
- F. SECONDARY DISPLAY
- G. S.STEEL SAMPLE WELL AND PRISM



## BOTTOM

- H. BATTERY COVER
- I. BATTERY COMPARTMENT





## GENERAL DESCRIPTION

### Significance of use

Thank you for choosing this refractometer. This instruction manual will provide you the necessary information for correct use of the meter.

The REI500 is an optical instrument that employs the measurement of refractive index to determine the % Brix of sugar in aqueous solutions. The method is both simple and quick. Samples are measured after a simple user calibration with deionized or distilled water. Within seconds the instrument measures the refractive index of the sample and converts it to % Brix concentration units.

The REI500 digital refractometer eliminates the uncertainty associated with mechanical refractometers and is easily portable for measurements in the field.

The measurement technique and temperature compensation 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 message codes.

Key features include:

- Dual-level LCD
- Automatic Temperature Compensation (ATC)
- Easy setup and storage
- Battery operation with Low Power indicator (BEPS)
- Automatically turns off after 3 minutes of non-use.

The REI500 refractometer is supplied in a rugged suitcase with:

- 9V battery, syringe and a clear user manual.

## TECHNICAL SPECIFICATIONS

Range	0 to 85% Brix / 0 to 80°C
Resolution	0.1% Brix / 0,1 °C
Accuracy	± 0.2% Brix / ±0,3°C
Light source	Yellow LED
Measurement time	± 1.5 seconds
Minimum Sample volume	100 JL (cover prism totally)
Sample Cell	SS ring en glass prism
Temperature Compensation	Automatic between 10 and 40 °C
Case material	ABS
Enclosure rating	IP 65
Battery Type/Live	1 x 9 volt AA battery / 5000 readings
Auto-shut off	After 3 minutes of non-use
Size	23,5 x 21 x 8 cm
Weight	Ca. 660 gram



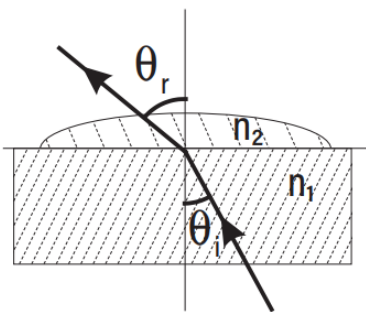
**PRINCIPE OF OPERATION**

The Brix determination is 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:

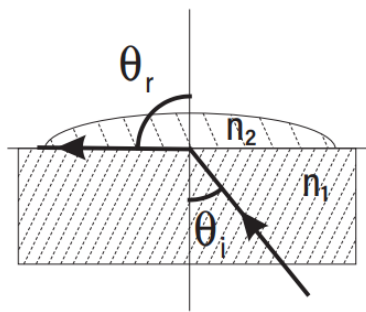
$$\sin (\theta_{\text{critical}}) = n_2 / n_1$$

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



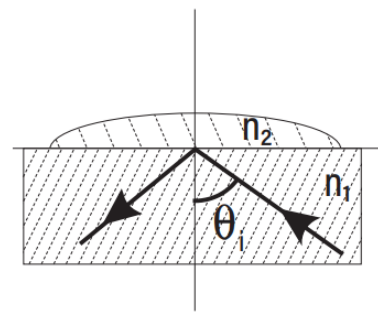
**Refraction**

$$\theta_i < \theta_{\text{critical}}$$



**Critical Angle**

$$\theta_i = \theta_{\text{critical}}$$



**Total Internal Reflection**

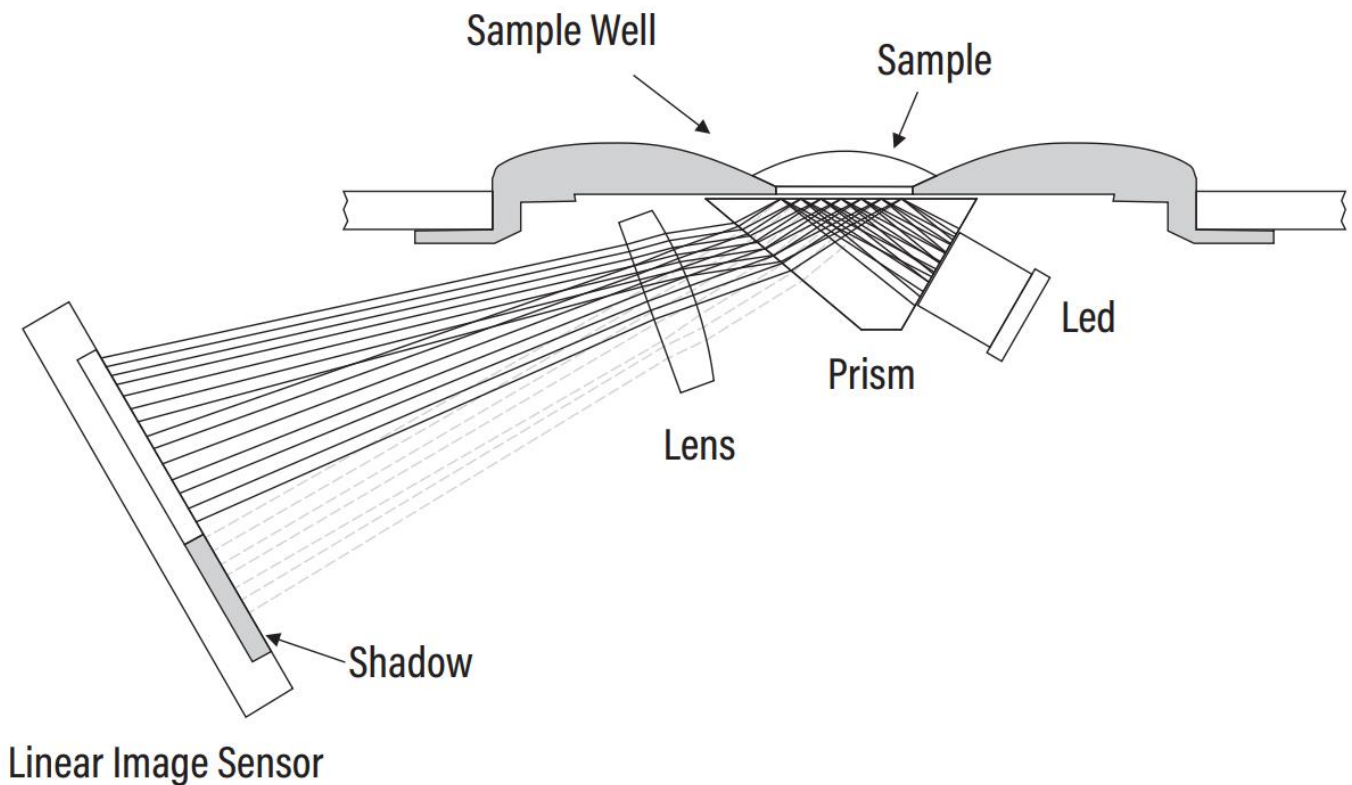
$$\theta_i > \theta_{\text{critical}}$$

$\theta_i$  = angle of incidence

$\theta_r$  = angle of refraction

$n_1, n_2$  - refractive index

In the RE1500, light from a 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. The RE1500 automatically applies temperature compensation to the measurement and converts the refractive index of the sample to sucrose concentration in units of percent (by weight) Brix.



## MEASUREMENT GUIDELINES

- Handle instrument carefully. Do not drop.
- Do not immerse instrument under water.
- Do not spray water to any part of instrument except the “sample well” located over the prism.

The instrument is intended to measure sugar solutions. Do not expose instrument or prism to solvents that will damage it. This includes most organic solvents and extremely hot or cold solutions.

Particulate matter in a sample may scratch the prism. Absorb sample with a soft tissue and rinse sample well with deionized or distilled water between samples.

Use plastic pipettes to transfer all solutions. Do not use metallic tools such as needles, spoons or tweezers as these will scratch the prism.



## CALIBRATION PROCEDURE

Calibration should be performed daily, before measurements are made, when the battery has been replaced, or between a long series of measurements.

1. Press the ON/OFF key, then release. Two instrument test screens will be displayed briefly; an “all segment” screen followed by the percentage of remaining battery life. When LCD displays dashes, the instrument is ready.



2. Using plastic pipettes, fill the sample well with distilled or deionized water.  
**Note:** If the ZERO sample is subject to intense light such as sunlight or another strong source, cover the sample well with your hand or other shade during the calibration.



3. Press the ZERO key. If no error messages appear, your unit is calibrated. (For a description of ERROR MESSAGES see page 11).

Note: The 0.0 screen will remain until a sample is measured or the power is turned off.



4. Gently absorb the ZERO water standard with a soft tissue. Use care not to scratch the prism surface. Wipe off the surface completely. The instrument is ready for sample measurement.

**Note:** If instrument is turned off the calibration will not be lost







## MEASUREMENT PROCEDURE

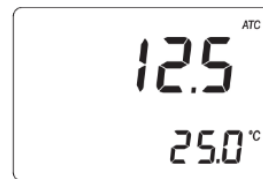
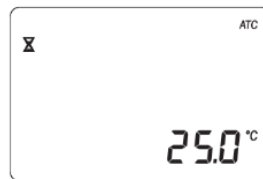
Verify the instrument has been calibrated before taking measurements.

1. Wipe off prism surface located at the bottom of the sample well.
2. Using plastic pipettes, drip sample onto the prism surface. Fill the well completely.



**Note:** If the temperature of the sample differs significantly from the temperature of the instrument, wait approximately 1 minute to allow thermal equilibration.

3. Press the READ key. Measurement is displayed in units of % BRIX.



**Note:** The ATC tag blinks and automatic temperature compensation is disabled if the temperature exceeds the 10-40 °C / 50-104 °F range.

4. Remove sample from the sample well by absorbing with a soft tissue.
5. Using plastic pipettes, rinse prism and sample well with distilled or deionized water. Wipe dry. The instrument is ready for the next sample.





## 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 100g.
- **Note:** Solutions above 60% Brix need to be vigorously stirred or shaken and heated in a water bath to roughly 40 °C (104 °F). Remove solution from bath when sucrose has dissolved. Cool completely before use. The total quantity can be scaled proportionally for smaller containers but accuracy may be sacrificed.

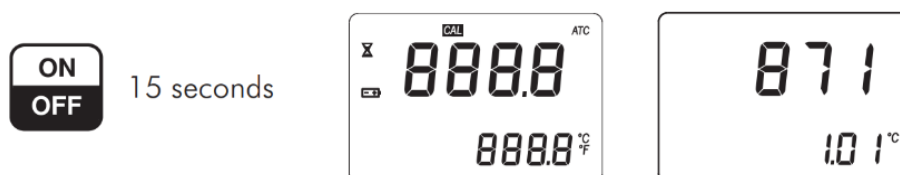
Example with 25% Brix:

<u>% Brix</u>	<u>g Sucrose</u>	<u>g Water</u>	<u>g Total</u>
25	25.000	75.000	100.000

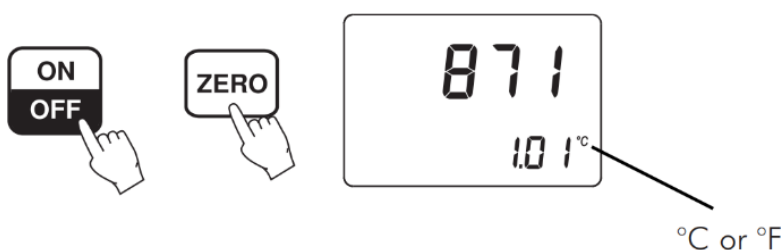
## CHANGING TEMPERATURE UNIT

To change the temperature measurement unit from Celsius to Fahrenheit (or vice versa), follow this procedure.

1. Press and hold the ON/OFF key continuously for approximately 15 seconds. The LCD will display the “all segment” screen followed by a screen with the model number on the primary display and the version number on the secondary display. Continue pressing the ON/OFF key.



2. While continuing to hold the ON/OFF key, press the ZERO key. The temperature unit will change from °C to °F or vice versa.





**ERROR MESSAGES**

<b>Err</b>		General failure. Cycle power to instrument. if instrument still has error, contact Nieuwkoop or your dealer.
<b>LO</b> Top display		Sample is reading lower than the 0% standard used for meter calibration.
<b>HI</b> Top display		Sample exceeds maximum measurement range.
<b>LO</b> Top display <b>Cal</b> segment ON		Wrong calibration used to zero instrument. Use deionized or distilled water. Press Zero.
<b>HI</b> Top display <b>Cal</b> segment ON		Wrong calibration used to zero instrument. Use deionized or distilled water. Press Zero.
<b>tLO</b> Top display <b>Cal</b> segment ON		Temperature exceeds ATC low limit (10°C) during calibration.
<b>tHI</b> Top display <b>Cal</b> segment ON		Temperature exceeds ATC high limit (40°C) during calibration.
<b>Air</b>		Prism surface insufficiently covered.
<b>Elt</b>		Too much external light for measurement. Cover sample well with hand.
<b>nLt</b>		LED light is not detected. Contact Nieuwkoop or your dealer.
Battery segment blinking		< 5% of battery life is remaining.
Temperature values are blinking <b>0.0°</b> or <b>80.0°</b>		Temperature measurement out of sampling range (0.0 to 80.0°C).
<b>ATC</b> segment blinking		Outside temperature compensation range (10 to 40°C).
<b>SETUP</b> segment blinking		Factory calibration lost. Contact Nieuwkoop or your dealer.

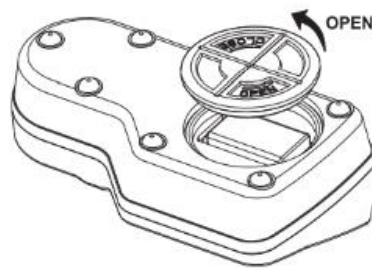
## **BATTERY REPLACEMENT**

To replace the instrument's battery, follow these steps:

- Turn the instrument OFF by pressing the **ON/OFF** key.



- Turn instrument upside down and remove the battery cover by turning it counterclockwise.



- Extract the battery from its location.
- Replace with fresh 9V battery making certain to observe polarity.
- Insert the back battery cover and fasten it by turning clockwise to engage.

For your Safety don't use or store the instrument in hazardous environments. To avoid damages or burns, do not perform any measurement in microwave ovens.

## **WARRANTY**

This instrument is warranted against defects in materials and manufacturing for a period of 2 years from the date of purchase. Electrodes are warranted for 6 months. If during this period the repair or replacement of parts is required, where the damage is not due to negligence or erroneous operation by the user, please return the instrument, electrode and probe to either distributor or our office and the repair will be effected free of charge. Damage due to accidents, misuse, tampering or lack of prescribed maintenance is not covered by the warranty.

Nieuwkoop BV reserves the right to make improvements in design, construction and appearance of its products without advance notice.



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