

VST inc
Lab Coffee III
Digital Refractometer



*Instructions for Base Models
Coffee & Espresso*

Read Instruction Manual Before Use

*Rev G
Made in USA*

© VST, Inc. 2012-2015

The VST Laboratory Grade Coffee Refractometer

Evaporative Cover &
Ambient Light Shield

Stainless-Steel
Sample Well

Sapphire
Optics

1024 Element
Detector Array

24-Character
Backlit Display

Rubber Armor Jacket



LAB Grade Precision & Accuracy

Temperature Stability Function

Multiple Measurements

Averaged Display

Coffee and Espresso
Scales Included

Smart Zero-Set Software

Optional Rugged Hard Case

Five Languages

Made in USA

VST CoffeeTools™
Mac OSX, iPad, iPhone
Windows & ANDROID



BEST NEW PRODUCT
SCAA 2010



Generates Brew Formula
Recipe: Dose, Brew Water
and Beverage Amounts at
specified extraction yield and
%TDS strength.

Measures results against
design targets

Conversions for Volumes,
Weights, Metric and US
Units

Works with virtually any brew
method: Drip, Immersion,
Cupping, Espresso

12 Warranty

A. What is covered and for how long:

Any defect in material and workmanship from use in accordance with the Instruction Manual, for one year from the date of purchase.

B. Who gets the Warranty:

This warranty is limited to the original purchaser of product.

C. What we will do:

If your VST product is defective, we will repair it or, at our option, replace it at no charge to you. If we repair your VST product, we may use new or reconditioned replacement parts. If we choose to replace your VST product, we may replace it with a new or reconditioned one of the same or similar design.

D. Limitations:

DAMAGE FROM LEAKING BATTERIES IS NOT COVERED BY VST's WARRANTY. Damage from submersion in any liquid is not covered by VST's warranty. EXCEPT AS SET FORTH ABOVE, NO WARRANTY OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE, OR OTHER WARRANTY, EXPRESS, IMPLIED OR STATUTORY, NOR ANY AFFIRMATION OF FACT OR PROMISE IS MADE BY VST WITH RESPECT TO THE GOODS WHICH ARE SOLD PURSUANT HERETO. VST SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL LOSSES, DAMAGES OR EXPENSES, DIRECTLY OR INDIRECTLY ARISING FROM THE SALE, HANDLING, OR USE OF THE GOODS, OR FROM ANY OTHER CAUSE RELATING THERETO, AND VST's LIABILITY HEREUNDER IN ANY CASE IS EXPRESSLY LIMITED TO THE REPAIR AND OR REPLACEMENT (IN THE FORM ORIGINALLY SHIPPED) OF GOODS NOT COMPLYING WITH THIS AGREEMENT OR, AT VST's ELECTION, TO CREDITING BUYER WITH AN AMOUNT EQUAL TO THE PURCHASE PRICE OF SUCH GOODS, WHETHER SUCH CLAIMS ARE FOR BREACH OF WARRANTY, NEGLIGENCE OR OTHERWISE.

E. How to Obtain Warranty Service:

To obtain warranty service for your VST product, you must provide proof of the date and place of purchase of the product, and have completed and returned the Warranty Registration Card to VST. You may obtain service by contacting VST at support@vstapps.com to obtain an RMA Form and then returning the product, shipping prepaid, to: VST, inc., Attention: Service Department, P.O. Box 61, Harvard, MA 01451 USA. Be sure to include your name, address, telephone number, RMA Form, proof of date and place of purchase and a description of the operating problem. If eligible for repair, VST will repair or, at our option replace, your VST product and return it to you freight pre-paid if in the 50 U.S. Users outside of the 50 U.S. must pre-pay return freight.

The above is your exclusive remedy under this warranty.

F. What this Warranty does not cover:

This Warranty does not cover batteries or lost screws (which are considered replacement parts), defects resulting from accidents, hinged items, damage while in transit to or from our service location, or damage resulting from leaking batteries, alterations, falls, misuse or abuse, lack of proper maintenance, unauthorized repair or modification of the product, affixing of any attachment not provided with the product, fire, flood or act of God, or failure to follow the Instruction Manual. This Warranty is the only one we will give on your VST product, and it sets forth all our responsibilities regarding your VST product. There are no other express warranties.

Specifications

VST LAB Coffee Refractometer	
Unit of Measure:	% TDS
Range:	0.00 - 20.00
TDS Resolution:	0.01%
1 Precision:	+/- 0.01%
2 Accuracy:	0.00 - 4.99%: ± 0.03% 5.00 - 20.00%: ± 0.05%
Display:	2-line, 24 characters LCD with Backlight
Prism Material:	Sapphire
Well Material:	Stainless Steel
Detector:	1024 elements
Temp Range:	15-40 Deg C
Instrument Resolution:	0.00001 nD
Temp Resolution:	0.01 Deg C
Sample Volume:	0.3ml
Measuring Time:	< 2 Sec (Typical)
Power:	2x (AAA)
Battery Life:	> 4,000 Measurements More with Backlight Off
Dimensions:	145 x 75 x 37 mm
Weight:	250 gr (8.8 oz)

Specifications are subject to change without notice.

The **VST LAB Coffee Refractometer** is sold in one or more configurations. The LAB Coffee Bundle includes:

- LAB Coffee Refractometer
- Gray Silicone Soft Case
- 50-pc Syringe Filter kit w/Syringes
- 10-pc Pipette Kit with cleaning pads
- VST CoffeeTools™ software for Mac OSX or Windows



Protected by US Patents

2 **Optional Accessories**

VST CoffeeTools™ Software

for Mac OSX or Windows

Mobile versions optional for: iPhone®, iPad®, ANDROID

See: www.VSTAPPS.com - SOFTWARE

Please refer to www.VSTAPPS.com - Refractometer ACCESSORIES for

Soft Case - soft silicone case available in multiple colors

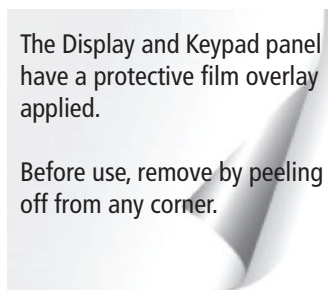
Hard Case - insulated, sealed against dust and water resistant. Protects instrument during transit, keeps temperature stable when moving to cooler/warmer locations.

Reference Solutions - Accurate to $\pm 0.02\%$ for 1.40% TDS and $\pm 0.03\%$ for 9.70% TDS. Used to check accuracy of the instrument at 20.0 ± 2.0 Deg C.

Syringe Filter Kit - For pre-filtering espresso or coffee brewed using metal filters - available in bulk qtys

Transfer Pipettes - to transfer samples without contamination to ensure accuracy - available in bulk qtys

Before Use



Temperature Correction

11

The VST LAB Coffee Refractometer is temperature corrected for aqueous (water-based) coffee and espresso solutions.

Temperature correction does not mean that a hot coffee or espresso sample can be placed directly into the sample well which is at ambient temperature. Rather, it means that the sample should first be cooled to the temperature at which the instrument was last calibrated, and that both the instrument and sample are within the temperature correction range of 15 to 35 °C.

In order for temperature correction to work properly, a small portion of the sample should be placed into a glass that has been at ambient temperature and allowed 20-30 seconds to cool before being transferred to the instrument sample well. Once placed, allow 15-20 seconds for the sample to reach temperature equilibrium with the instrument.

For the most accurate and repeatable results it is recommended that the instrument, distilled water used to calibrate the instrument, glass or ceramic cooling cups, and the sample to be measured *all be at the same temperature* and within the range of 15 to 35 °C.

Samples filtered with the VST COF/ESP syringe filters will yield the most stable, repeatable results.

TIP:

Hold <GO> for five seconds to turn instrument OFF.

Hold <MENU> for five seconds to display serial number and firmware version.

10 **Instrument Features**

The **VST LAB Coffee III** refractometer represents a significant improvement in accuracy and precision over previous models and are satisfactory for laboratory use. Battery life is double previous models. The instruments feature a 1,024 element detector array and sapphire prism for superior resolution and accuracy. Precision is typically $\pm 0.005\%$ and typical accuracies are better than $\pm 0.02\%$ in the coffee range, and $\pm 0.04\%$ in the espresso range. Temperature is resolved to 0.01 Deg C internally, and refractive index to 0.000008 nD.

The two-line backlit LCD display offers improved readability in poor lighting or brightly lit locations with reflections. The low-power LED backlight auto dims after 20 seconds to preserve battery life. The backlight dims during measurement to improve precision and battery life, and returns to ON when the measurement is completed and displayed. You may turn backlight off for longer battery life, or when batteries are low to extend remaining life. A menu function is provided to disable backlighting. Under typical use, without backlight, a single set of batteries should last for 4,000 or more measurements. The instrument will automatically power OFF when idle for three minutes. Measurements are displayed for a full three minutes before auto-shut down.

The instrument reads each sample multiple times and displays an averaged value to reduce noise and erratic measurements. A temperature stabilization software feature prevents false calibration if the water sample temperature is not stable during zero set or exceeds approximately 35 Deg C.

Five languages are supported – English, French, Spanish, German and Russian.

Accessory soft silicone jackets and hard cases available for protection to help ensure the instrument will not be damaged by excessive shock and vibration during use or transit. High accuracy reference solutions at 1.40% and 9.70% TDS are available at www.VSTAPPS.com to verify instrument accuracy.

Introduction

3

The **VST LAB Coffee** digital refractometers for Coffee & Espresso TDS are advanced fourth-generation handheld instruments that put laboratory precision in the palm of your hand. Accuracy and precision of the VST LAB Coffee refractometers are comparable to state-of-the-art dehydration ovens, and rival bench top laboratory refractometers with Peltier trays. VST's latest LAB Coffee refractometers achieve typical accuracies of $\pm 0.02\%$ with precision of $\pm 0.01\%$.

Designed for the rapid and accurate determination of coffee concentrations, these instruments will automatically correct for temperature within the range of 15 - 35 °C (59 -94 °F), and when used and cared for properly, will provide years of trouble-free service.

This manual will help you maximize the usefulness of your instrument, and it's recommended that it be read carefully before use. If you have any questions, please contact VST technical support at: **support@vstapps.com**

The 4th generation VST LAB Coffee III instrument is equipped with a single auto-ranging scale that measures coffee-espresso concentration from 0.00-20.00 % Total Dissolved Solids. Refractive Index is measured internally to a resolution of 0.000008 nD, and temperature to 0.01 Deg C. See specifications for range, resolution, accuracy and precision.

IMPORTANT:

When measuring espresso or coffee brewed with woven mesh or punched/etched metal filters, or for cupping methods, samples must be filtered prior to measurement to remove non-dissolved, suspended solids using a VST coffee/espresso syringe filter.

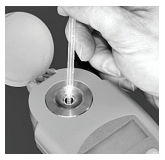
Read the section about **Filtering Espresso and Coffee** in this instruction sheet for more information on pre-filtering prior to making measurements.

4 Calibration - Zero Set

The VST Coffee Refractometer MUST be Zero Set before initial use and periodically thereafter for changes in ambient temperature of more than 2 Deg C. It is recommended that a Zero Set be performed at least once a day as well as prior to performing tests requiring the highest accuracy, or when moving between environments with changes in ambient temperature.

Distilled or deionized water is required for Zero Setting the instrument. The water temperature for zero setting should be between 15-35°C (59 to 95 °F). To ensure accuracy, it is important to independently verify that you are calibrating the instrument with distilled or deionized (DI) water and not just a clear liquid which you think is DI water. RO (reverse osmosis) water is not recommended for Zero Set.

1 Inspect the measuring surface to make sure it is clean and dry. Place a few drops of distilled water on the measuring surface.



2 Close the sample cover and allow some time for the temperature to equalize. The sample cover MUST be closed to calibrate or take measurements.



3 Press and release <GO> to turn the instrument on.



4 Press and release <MENU> until the display reads:

Set Zero?
[GO] To Set



5 Press and release <GO> to automatically zero the instrument. Remember to clean and dry the measuring surface after zero-set.



If the calibration was successful the instrument will display "READY" otherwise, an error message will be displayed. If temperature changes during zero-set, the instrument will automatically re-try.

Filtering Procedure for Espresso or Coffee

1 Allow 1 minute for espresso to cool and CO₂ to diffuse out of solution, and stir sample for 4-5 seconds.



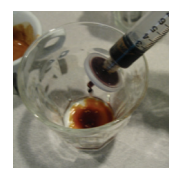
2 Draw about 3-4 mL espresso with syringe tip under the crema, and without touching the bottom



3 Attach syringe filter and tighten until snug, about a quarter turn. Do not over-tighten.



4 Slowly express about 2 mL into a clean, dry glass. Allow 30-60 seconds to cool. CONTINUE with Step 2 of Sampling Procedure, below.



Sampling Procedure

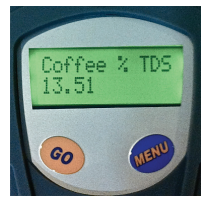
1 Draw a 0.2 - 0.4 mL filtered sample using a pipette and transfer to a clean dry cup or glass that is at ambient temperature. Let cool for 30-60 seconds.



2 Using a fresh pipette, transfer the cooled sample to the instrument Sample Well. Close cover. Allow 20-30 seconds to equilibrate.



3 Press GO to take a measurement.



Filtering Espresso

When measuring espresso, you must filter the sample prior to cooling and measurement to remove non-dissolved solids that pass through metallic filters as well as to degas CO₂ infused into solution. Using an incorrect syringe filter or a simple paper or similar filter, or using no filter at all will result in inaccurate and erratic measurements. Sediment from unfiltered or inadequately filtered espresso will settle with gravity to cause reflections that interfere with accurate measurements. Unfiltered or improperly filtered espresso will not be degassed. CO₂ gas reduces the density and therefore also the refractive index, causing lower than actual readings and can be excessive with fresh roasted coffees. The VST Coffee-Espresso filters are designed specifically to solve both of these problems and provide a fast, effective method of achieving repeatable results.

Filtering Coffee

Generally, coffee brewed with gravity drip methods, and paper or cloth filters and ground to nominal drip grades **does not need to be filtered prior to measurement**. However, coffee brewed with metal filters such as press-pot, Clover®, trifacta, or Swiss Gold, or without filters—such as coffee prepared for cupping, cold-processed or turkish methods, should be pre-filtered, as above, using a syringe filter before measurement. AeroPress® brewers use paper filters but are mechanically assisted, resulting in high forces and high levels of sediment. These samples should be filtered using a VST syringe filter prior to measurement. Coffee ground at a fine setting or using an espresso grinder, even if brewed through a paper filter, should be filtered using a syringe filter prior to measurement.

Note: When comparing % TDS measurements made with a refractometer to those taken by a dehydration method, the espresso beverage sample to be dehydrated must also be filtered first, using a method similar to that recommended, below, so that both measurements are Total Dissolved Solids measurements, versus total brew solids, in the case of unfiltered espresso.

One filter is required for each measurement. Do not force more liquid through a filter that has reached its maximum capacity, or bursting of the device may occur resulting in loss of sample or personal injury.

Syringe filters can not be flushed and re-used. Any dilution, whether via a new coffee sample or water effectively **contaminates the new sample and any such measurement will be invalid.**



The Span Set function is used by the factory to set a calibration point toward the upper end of the VST Espresso range. Span Set is used at the factory to determine if re-calibration is required, i.e., the instrument no longer meets specifications.

Normally, Span Set is not required throughout the life of the instrument, unless it is dropped or subject to other significant shock and vibration.

If you have reason to believe the instrument is not providing correct measurements, you can confirm using the VST Reference Solutions or you can return it to VST for testing.

Maintenance and Upgrade Note:

Most VST LAB Coffee refractometers may be upgraded to latest firmware revision and re-calibrated for a fixed fee of \$259-\$299 (subject to current fee). Other repairs, upgrades or exchanges, if needed, are not included in this charge. For firmware upgrades, latest fees, and re-calibration services, contact VST SUPPORT with your serial number, proof and date of purchase and request an RMA prior to returning your instrument to VST. Press and Hold MENU for S/N and Firmware version information.

Reference Solutions - Accurate to $\pm 0.02\%$ for 1.40% TDS and $\pm 0.03\%$ for 9.70% TDS, are used to check accuracy of the instrument at 20.0 ± 2.0 Deg C, and are available from: www.VSTAPPS.com

Contact VST at support@vstapps.com
for calibration reference fluids.

6 **Menu Options**

Various options are accessible through the <MENU> button. With the instrument “ON”, press and release <MENU> to step through the options.

COFFEE % TDS – press [GO] to Set

This option sets the default unit of measure, or scale, the instrument will read. Some instruments are programmed with more than one scale, or a separate ESPRESSO % TDS scale. Later revision instruments have a single auto-ranging COFFEE % TDS scale that covers the entire range of coffee through espresso.

Pressing

<MENU> will step through all available scales. Press <GO> to set the a scale as the default.

SET ZERO? – press [GO] to Set

The Zero Set option will zero or calibrate the instrument to pure water. See “Calibration - Zero Set.”

Set Span? – press [GO] to Set

The Span Set option will calibrate the upper range of the instrument to a special calibration solution. See “Calibration - Span Set.”

LCD-Light? – press [GO] YES

This option allows you to turn the LCD display backlight on or off. The options are “Yes” and “NO.” Later revision instruments turn backlight OFF momentarily during read to enhance battery life.

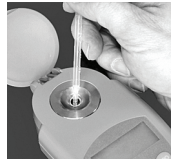
Language? – press [GO] to Set

This option allows you to set the display to a particular language; English, Spanish, German, French, or Russian. Just follow the prompts to your language of choice and press <GO> to set.

7 **Taking a Measurement**

Follow the steps below to accurately measure a coffee or espresso sample:

- 1** Inspect the measuring surface to make sure it is clean and dry. Place a few drops of the sample to be tested on the measuring surface. The instrument need not be on.



- 2** Close the sample cover and allow some time for the temperature to equalize. A good rule-of-thumb is to wait 10 to 20 seconds for the sample to equilibrate to the temperature of the instrument.



- 3** A single press and release of <GO> will turn the instrument on.



- 4** Press <GO> a second time to start the measurement. The display will indicate Coffee % TDS or Espresso % TDS on the first line of the display and * READING * on the second line. On later revisions backlight turns OFF momentarily during a measurement.



Notes:

The instrument will not take a measurement if it detects the sample was at a significantly different temperature than the prism. An error message “TEMPERATURE STABLE ERROR” will be displayed.

- 5** The reading will take approximately 2-3 seconds and the result displayed on the screen is the average of several measurements.



Contact VST at support@vstapps.com
for calibration reference fluids.