

Operating Manual

Cole-Parmer® **Handheld Digital Refractometers**



INTRODUCTION

Thank you for choosing our refractometer. This is an easy-to-use device, requiring little to no training. Please read the manual before using to ensure optimal measurement.

The refractometer is designed for fast and accurate determination of fluid concentrations. The instrument will automatically compensate for temperature fluctuation and can be used for years of trouble-free service when properly and regularly maintained. Instrument has an IP65 waterproof rating.

The refractometer represents reading relative to Brix scale. The Brix scale originated in the food industry and is primarily a unit of measure corresponding to percent of sugar in a sugar and water solution. The actual Brix value represents the number of grams of cane sugar in a 100-g cane-sugar solution (percent sugar wt./wt.). This direct reading relationship holds true only for sucrose solutions. When measuring non-sugar solutions, the Brix scale should be thought of as an arbitrary scale. To make these arbitrary units of measure meaningful, they must somehow be correlated to the concentration on the solution you are testing. This is accomplished by creating a chart of solution concentration relative to the Brix scale. A separate must be made to each type of solution being tested.

Unpacking

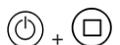
Check individual parts against the list of items below. If anything is missing or damaged, please contact your instrument supplier immediately.

1. Refractometer
2. Soft and clean cloth
3. Hard carrying case
4. Operation manual
5. Two AAA batteries

LCD DISPLAY



KEYS (BUTTONS)

	1. Turn on meter; or 2. Turn off meter after pressing for 3 seconds.
	1. Zero calibration; or 2. Press for 2 seconds to toggle between °C and °F.
	1. Press the button to read after drop samples; or 2. Press for 2 seconds to toggle between measured items.
	Reset to factory setting.

SPECIFICATIONS

Range	Resolution	Accuracy	ATC	Catalog number
0 to 45% Brix, 1.3330 to 1.4098 RI	0.1, 0.0001	±0.2, ±0.0003	Yes	81150-48
0 to 85% Brix, 1.3330 to 1.5100 RI	0.1, 0.0001	±0.5, ±0.0003	Yes	81150-55
0 to 95% Brix, 1.3330 to 1.5400 RI	0.1, 0.0001	±0.5, ±0.0003	Yes	81150-56
0 to 28% NaCl, 1.3330 to 1.4100 RI	0.1, 0.0001	±0.2, ±0.0003	Yes	81150-49
0 to 45% Brix, 0 to 28% NaCl, 1.3330 to 1.4100 RI	0.1, 0.1, 0.0001	±0.2, ±0.2, ±0.0003	Yes	81150-57
0 to 60% v/v, w/w ethyl alcohol	0.1	±0.3	Yes	81150-52
0 to 60% v/v, w/w, isopropyl alcohol; -58 to 32°F, -50 to 0°C	0.1	±0.5	Yes	81150-53
0 to 75% ethylene glycol, -58 to 32°F, -50 to 0°C	0.1	±0.3, ±1°F, ±0.5°C	Yes	81150-54

Temperature measurement range: 32 to 104°F (0 to 40°C)

Measurement range: Please see table above.

Precision of measurement temperature: ±1°F (0.5°C)

Automatic temperature compensation: 41 to 104°F (5 to 40°C)

Minimum sample volume: 0.3 mL

Measuring response time: ≤3 seconds

Power supply: two AAA batteries

Battery life: ≥5000 readings

Dimensions (L x W x H): 5.7" x 2.6" x 1.5"(145 x 67 x 38 mm)

Weight: 6.5 oz (185 g)

AUTO TEMPERATURE COMPENSATION (ATC)

Refractive index (RI) is very temperature-dependent. It is well known that substantially all materials expand when heated (i.e. become less dense) and contract when cooled (i.e. become more dense). The speed of light in a liquid increases as temperature increases, and refractive index, therefore, decreases. Although this thermal effect is minor for solids, the change in density for a liquid is substantial. ATC ensures that concentration readings of aqueous (water-based) solutions will be accurate with respect to sample's temperature.

The refractometer is temperature compensated for aqueous (water-based) sucrose solutions and can automatically compensate for temperature differences within the range of 41 to 104°F (5 to 40°C). The temperature of the sample, however, has little bearing on the accuracy of the reading. In most cases, the sample almost immediately assumes the temperature of the refractometer, the ambient temperature, and the fluid should be in equilibrium within the instrument's temperature range.

CALIBRATION: ZERO SET

The refractometer must be set to zero before initial use and periodically thereafter. It is recommended that calibration be performed at least once a day as well as prior to performing tests requiring the highest precision, or when moving between environments with extreme changes in ambient temperature. A clean container of water is all that is needed to automatically calibrate the instrument. Although tap water may be used, distilled or deionized water is recommended. The water temperature for calibration should ideally near 68°F (20°C).

1. Inspect the measuring surface to make sure it is clean and dry.
2. Place a few drops of calibration liquids on the prism window, making sure to eliminate any bubbles.
3. Press  to start calibration.
4. The unit shows the process of zero setting (Fig 2.1).
5. If calibration is successful, it will show "Pass" (Fig 2.2).
6. If calibration is not successful, it will show "Fail".
7. After calibration process is finished, the LCD will return to temperature mode. The calibration result will be saved and will be the new zero point after the device is powered off and on again.



Fig 2.1



Fig 2.2

Note: After calibration, please remember to clean the liquid from the prism surface and keep the prism surface dry and clean to avoid erosion.

MEASUREMENT

1. Make sure the prism surface is clean and dry.
2. Place a few drops of the sample on the prism.
3. Press  key, "----" will be shown on the screen.
 - Test result(s) will be shown on the screen (Fig 3.1).
 - The result(s) will be stored in the device for up to 60 seconds.
 - Press the "Power" button to recheck the previous measurements.
4. After testing, please remember to clean and dry the surface when you are done.



Fig 3.1

Scale Selection

1. Hold  for 2 seconds, the scale will change to the next measurement type (Fig 4.1).
2. Repeat Step 1 until desired scale is shown on the screen.
3. The device saves the last selected scale.



Fig 4.1

Temperature Selection

1. Hold  for 2 seconds, the temperature unit will change between °F and °C.
2. The device saves the last selected temperature unit.

Resetting

1. Press  + , the option of returning to factory setting of zero will be shown on the screen (Fig 5.1).
2. Press  button to confirm resetting, or press  to cancel.



Fig 5.1

STATUS

1. Press  to turn on the device.
2. Press  to turn off the device; the LCD will show the process (Fig 6.1).
3. To conserve energy, the device enters Sleep Mode after standing by for more than 60 seconds. Press  to wake up the device.
4. The refractometer will turn off after 90 seconds of nonuse.



Fig 6.1

TROUBLESHOOTING

Zero setting error (Fig 7.1)

– Out of calibration (zero set) range.

Action needed: Make sure there is a sufficient amount of clean calibration water to cover the prism surface.



Fig 7.1

Measurement Errors

– **High** – exceeds the specified measurement range (Fig 7.2).



Fig 7.2

– **Low** – falls below the specified measurement range (Fig 7.3).



Fig 7.3

– **Error** – no liquid on the prism or not sufficient amount of liquid (Fig 7.4).



Fig 7.4

Temperature errors

– **High** – temperature exceeds range (Fig 7.5).

Action needed: Check temperatures of the sample liquid, the device, and the ambient surroundings.



Fig 7.5

– **Low** – temperature falls under range (Fig 7.6).

Action needed: Check temperatures of the sample liquid, the device, and the ambient surroundings.



Fig 7.6

Battery Error

– **Low** – battery indication (Fig 7.7).

Action needed: Replace with two new AAA batteries when the battery icon is red.



Fig 7.7

MAINTENANCE

WARNING

Failure to follow these precautions will void the warranty and may cause instrument damage or inaccurate readings.

Please keep the measuring surface clean. It is extremely important to thoroughly clean the measuring surface after each use with a wet, soft, clean cloth or paper or towel, dampened with a mild liquid dish soap and water. This may prevent cross-contamination between samples and provide accurate subsequent readings.

Note: The use of solvents or petroleum-based cleaners is not recommended.

Important Precautions

- To ensure the LCD displays properly, don't expose the instrument to an environment with too low or too high temperature or prolonged exposure of strong direct sunlight.
- The instrument should be protected against jarring or violent shocks.
- Do not disassemble the instrument or change the inner parts.
- Calibration should be implemented strictly according to the manual.
- Be sure to clean the prism surface and window of stage before and after every measurement.
- To avoid having the accuracy become affected by evaporation, be sure to perform measurement immediately after dripping solution on window of stage.
- It may cause wrong result if keep measuring under low voltage.
- Do not use the instrument in a humid and/or corrosive environment.
- During the measurement, avoid strong light (sunlight, lamp, etc.).
- When storing the instrument for long periods of time, it is advisable to remove the batteries. Use only AAA batteries. Pay close attention to battery polarity when inserting batteries; reversing the polarity can cause instrument damage.

Warranty

This instrument is warranted against defects in materials and workmanship for a period of one (1) year from the date of invoice. For claims under the warranty, please contact

Cole-Parmer. The warranty does not cover fair wear and tear of parts or accessories, nor does it apply to improper use, abnormal operation or insufficient maintenance which is not in accordance with the instructions in this user manual.

Repairs/Return Delivery

Please contact Cole-Parmer for troubleshooting, repairs, or returns. If possible, use original packaging when returning the instrument to prevent any damage during shipment.



Toll-free: **1-800-323-4340**

Phone: **1-847-549-7600**

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ColeParmer.com