Specifications

<table>
<thead>
<tr>
<th>Unit of Measure</th>
<th>PA201</th>
<th>PA202</th>
<th>PA203</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Resolution</td>
<td>±0.1%</td>
<td>±0.1%</td>
<td>±0.1%</td>
</tr>
<tr>
<td>Precision</td>
<td>±0.05%</td>
<td>±0.05%</td>
<td>±0.05%</td>
</tr>
<tr>
<td>Well Material</td>
<td>Stainless Steel</td>
<td>Stainless Steel</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Max. Sample Volume</td>
<td>75 ml</td>
<td>75 ml</td>
<td>75 ml</td>
</tr>
<tr>
<td>Weighing Time</td>
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<td>3-5 sec</td>
<td>3-5 sec</td>
</tr>
<tr>
<td>Power Supply</td>
<td>2 x AAA Batteries</td>
<td>2 x AAA Batteries</td>
<td>2 x AAA Batteries</td>
</tr>
<tr>
<td>Dimensions</td>
<td>145 x 75 x 37 mm (5.7 x 2.95 x 1.46 in.)</td>
<td>145 x 75 x 37 mm (5.7 x 2.95 x 1.46 in.)</td>
<td>145 x 75 x 37 mm (5.7 x 2.95 x 1.46 in.)</td>
</tr>
<tr>
<td>Weight</td>
<td>250 grams (8.8 Oz.)</td>
<td>250 grams (8.8 Oz.)</td>
<td>250 grams (8.8 Oz.)</td>
</tr>
<tr>
<td>Languages</td>
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<td>3 Language: English, French, Spanish, German, &amp; Russian</td>
<td>3 Language: English, French, Spanish, German, &amp; Russian</td>
</tr>
<tr>
<td>Display</td>
<td>1-line x 12 Characters</td>
<td>1-line x 12 Characters</td>
<td>1-line x 12 Characters</td>
</tr>
<tr>
<td>Color</td>
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<td>Blue, Black, Black</td>
<td>Blue, Black, Black</td>
</tr>
</tbody>
</table>

**The Palm Abbe® Digital Refractometer**

**Instruction Manual**

PA201, PA202, & PA203

6275 Goughan Road
Solon, OH 44139-3316
TEL 440.349.1500
www.misco.com

**WARNING**

THE SAFETY INSTRUCTIONS AND WARNINGS PRESENTED BELOW AND ELSEWHERE IN THIS MANUAL ARE MINIMUM REQUIREMENTS FOR THE SAFE AND RELIABLE OPERATION OF THIS EQUIPMENT. THESE PRECAUTIONS MUST BE OBSERVED DURING ALL PHASES OF USE OF THIS EQUIPMENT. FAILURE TO COMPLY WITH THESE PRECAUTIONS OR WITH SPECIFIC WARNINGS GIVEN ELSEWHERE IN THIS MANUAL COULD RESULT IN DEATH OR SERIOUS INJURY.

READ THIS MANUAL BEFORE USING THIS EQUIPMENT. You must read and follow this Manual before operating this equipment. If you have any questions, contact MISCO technical support before use.

KEEP MANUAL AVAILABLE. Keep this Manual available for reference in a safe and accessible location.

FLUIDS TESTED MAY BE HAZARDOUS OR TOXIC. You must read and follow all safety instructions and handling procedures in the Material Safety Data Sheet (MSDS) and/or Safety Data Sheet (SDS) for each fluid you choose to test. Pay careful attention to the information concerning Hazards, and to the instructions and warnings for Handling and Storage, and Exposure Controls/Personal Protection. If testing body fluids, take precautions to prevent exposure. In all cases, properly discard any residual sample after testing.

**INTRODUCTION**

The MISCO Palm Abbe refractometers are advanced fourth-generation handheld digital refractometers that put laboratory precision in the palm of your hand. They are designed for the rapid and accurate determination of fluid concentrations. These instruments will automatically compensate for temperature with computer precision, 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 MUST be read completely before use. If you have any questions, please call:

MISCO technical support at 440-349-1500.

The PA201 is equipped to take readings on the Brix scale and utilizes sucrose as the temperature compensation basis.

The PA202 is equipped to take readings on the Brix and Refractive Index (nD) scales. Both scales use sucrose as the temperature compensation basis. The PA202 may have up to two custom scales and may have special temperature compensation.

The PA203 may have from one to five different scales, each scale having an individual unit of measure and temperature compensation basis.

To the extent that your particular instrument is equipped with scales other than those described above, the scale specifications will be documented on a specifications card accompanying the instrument.

**Menu Options**

Various options are accessible through the <MENU> button. With the exception of the Factory Settings menu option, all menu options are set at the factory and can not be altered by the user.

- **Language**
  - English
  - French
  - Spanish
  - German
  - Russian

- **Zero Set**
  - Sets instrument to zero using water as a standard for zeroing instrument.

- **Span Set**
  - Sets instrument to a particular calibration point in the Brix scale.

- **Backlight**
  - Turn backlight on or off.

- **Scale**
  - Sets the display to a particular scale.

- **Calibration - Zero Set**
  - Sets instrument to zero using water as a standard for zeroing instrument.

- **Calibration - Span Set**
  - Sets instrument to a particular calibration point in the Brix scale.

- **Auto Temp. Comp.**
  - Compensates for changes in temperature.

- **Prism Material**
  - Sets the Prism Material to Stainless Steel.

- **Well Material**
  - Sets the Well Material to Stainless Steel.

- **Auto Cal.**
  - Automatically calibrates the instrument.

- **Manual Cal.**
  - Manually calibrates the instrument.

- **Threshold**
  - Sets the threshold for the instrument.

- **Preference**
  - Sets the preference for the instrument.

- **Factory Settings**
  - Reset all options to factory settings.

**Calibration - Span Set**

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Taking Readings

Follow the steps below to accurately measure a fluid sample:

1. A single press and release of <GO> will turn the instrument on. If your instrument has more than one scale, you can press <MEMO> to select a different scale.

2. Auto Temp. Compensation

- Press <MEMO> to automatically trigger a reading.
- The display will indicate the default scale name on the first line of the display and * 19°C/66°F * on the second line.

3. The reading will take approximately five seconds and the result will be displayed on the screen.

4. Press and release <GO> to take a second reading. Remember to clean and dry the measuring surface when finished.

Troubleshooting

The most common source of error is trying to take readings with the cover open. If this is not the case, and you suspect the instrument is malfunctioning or giving an erroneous reading, try zero setting it and take a reading of water to check the zero set. If the instrument readings are still suspicious, replace the battery and repeat the above procedure.

If the instrument "locks up" and will not read or shut off, clean the instrument by removing the batteries. If the unit fails to display "MISSC / PML Abbe II" when starting, check battery insertion and polarity. If the unit still will not start, check battery charge and/or replace batteries. If batteries are good and instrument still will not start, call MISCO Technical Support at (440)349-1500.

Error Codes:

- No sample detected.
- Close cover / press <GO>!
- Sample temperature outside acceptable range (too high or too low).
- Concentration out of range too high (+) or low (-).
- Time to charge the batteries.

Charting Solution Concentrations

If you are measuring sucrose solutions, you may read percent sucrose directly on the Brix scale; otherwise, the readings must be converted into solution concentrations to be useful to the user. The Brix scale originated in the food industry and is primarily a unit of measure corresponding to the percent of sugar in a sugar water solution. The actual Brix value represents the number of grams of cane sugar in a 100 gram cane sugar solution (percent sugar by weight). This direct reading relationship holds true ONLY for sucrose solutions.

Refractive index units (n20o) represent a physical property of a substance but are not particularly helpful without a table to reference them.

Keep Measuring Surface Clean! It is extremely important to thoroughly clean the measuring surface after each use. Wash, clean cloth or paper towel. This will prevent cross contamination between samples and provide accurate subsequent readings. Keep the measuring surface clean and free of residue at all times. The instrument body may be cleaned with a soft, clean cloth or paper towel, dampered with a mild liquid soap and water. The use of solvents or petroleum-based cleaners is not recommended. Refractive index is very temperature dependent. It is well known that an increase in temperature causes (become more dense) and contract when cooled (become less dense). Automatic-temperature-compensation increases, and the refractive index, therefore, decreases.

Troubleshooting

- Do not submerge instrument in liquids.
- Do not hold instrument under running water.
- Do not leave instrument in direct sunlight or in a vehicle on a sunny day.
- Do not subject instrument to temperatures above 50°C (122°F) or below -30°C (-22°F).
- Do not attempt to repart, modify, or disassemble any portion of the instrument.
- Do not use liquid filled instrument onto clothing or other surfaces after taking readings.
- Do not subject instrument to strong shocks or vibration.
- Do not use a metal device to transfer samples to the measuring surface.
- Do not use an instrument unless you have personal knowledge of it's calibration.
- Do not attempt to recharge the batteries without the instrument.
- Do not press the batteries with anything other than a finger.

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.

Press the buttons with anything other than a finger.

DO NOT press the buttons with anything other than a finger.

DO NOT use a metal device to transfer samples to the measuring surface.

Care & Maintenance

Warranty & Service

The warranty for your MISCO Product is included with the original product packaging. To obtain warranty service, contact your local authorized MISCO distributor or store retailer so, in most cases, the sample almost immediately assumes the temperature of the instrument. For the most accurate possible results, the instrument, the ambient temperature, and the fluid should be in equilibrium with the instrument's temperature range.

To make both Brix and refractive index units more meaningful, they must somehow be correlated to the concentration of the solute you are testing. This is accomplished by creating a chart of solution concentrations relative to the scale. A separate chart must be made for each type of solution being tested. Occasionally, the manufacturer of the solution will provide a reference chart relating the solution's concentration to Brix or refractive index. If such a chart is not available, it is quite easy to construct one following the instructions below.

Step 1

- Take a Brix reading for each prepared sample with the Palm Abbe and the sample at or near room temperature (20°C / 68°F). Record the results and plot them on graph paper. Remember to add a point at 0.0 Brix for water.

Step 2

- Draw a straight line between the plotted points along a path that best represents the center of the data. Do not be concerned if some of the points fall slightly off the line. The concentration for future measurements of the same fluid can be determined by matching the concentration value for your fluid against the corresponding concentration on your graph. A separate graph must be constructed for each type of fluid used.

Special Care of Rubber Armor Jacket

If your Palm Abbe is equipped with the optional Rubber Armor Jacket, you must take special care to ensure that any excess sample does not leak down and become trapped between the jacket and instrument body. If this happens, pull the instrument from the Rubber Armor and wipe off the fluid before storing. This step is especially significant if the Palm Abbe is stored in the rugged waterproof storage case, since subsequent draining of the fluid will remain trapped in the case. This is even more important if you are testing hazardous or corrosive fluids that could damage the Palm Abbe or leak onto people or other equipment over time.

DO NOT attempt to repair, modify, or disassemble any portion of the instrument.

DO NOT use a metal device to transfer samples to the measuring surface.

DO NOT press the buttons with anything other than a finger.

DO NOT let liquid fall from instrument onto clothing or other surfaces after taking readings.

DO NOT attempt to recharge the batteries without the instrument.

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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.