3820-W01



Instruction Manual

Digital Hand-held 'Pocket' Refractometer



Introduction

Thank you for purchasing the "Digital Hand-hold 'Pocket' Retractometer PAL-2". Before using your PAL-2, read this instruction manual carefully and understand how to use it. After reading this manual, keep it on hand for future reference.

This operation manual describes the items which you are required to observe in order to use the PAL-2 safely to prevent injury to you and other people and damage to your properly. Understand them first and then read the following pages to use your PAL-2 correctly. Read it carefully.

⚠ WARNING

- ♦ When measuring a substance harmful to the human body, be well aware of its properties and put on
- protective gloves, mask, etc.

 If the instrument is dropped or is subjected to a strong shock, have it inspected by an ATAGO distributor.

 Do not attempt to repair, modify, or disassemble the instrument yourcell.

A CAUTION

- \diamondsuit If this instrument is used to measure highly acidic samples, the prism and sample stage may be damaged resulting in inaccurate measurements.
- resulting in inaccurate measurements.

 The prism is made of optical glass. Do not tap or contact its surface with any metal tool such as a spoon or tweezers. If the surface of the prism is damaged, inaccurate measurements will occur.

 Carefully read this instruction manual and fully understand the function and operation of each part of the instrument before use.
- Make sure to use the specified battery or that which was supplied with the refractometer as an accessory.

 When loading the refractometer with a battery, pay heed to the potenties of the battery.

 Use the instrument at an altitude below 5,000 m (above sea level).

 Do not leave the instrument in a location exposed to direct sunlight or near a heating unit where the
- Do not leave the instrument in a location exposed to direct samight or near a intemperature may rise.
 Do not change the environmental temperature of the instrument suddenly.
 Do not place the instrument in a place where it may be subject to strong intertions.
 Do not use the instrument where there is much dust.
 Do not leave the instrument where the temperature is extremely low.
 Do not place or drop heavy objects on the instrument.

When measuring a sample and the ELI* function indicates. the warning message [nnn] on the LCD, shade the sample stage with your hand and measure the sample again >



When measuring a sample, if the PAL-2 is subject to intense light, such as direct sunlight, light at dusk, or a spotlight, the ELI function will display the warning message [nnn,! (Fig. A) immediately after the START key (or the ZERO key) is pressed. In this situation, shade the sample stage with your hand, and then press the START key (or the ZERO key) again.

When interest light penetrates the prism of a digital refractometer, the light waves interers with the

which interest eight persentates the present of a algital refractometer, the light waves interers with the sensor resulting in inaccurate readings. To ensure accurate measurement results each time, the PAL-2 is programmed with the ELI function to display the warning message [nnn] when intense direct light is detected. Forming a habit of shading the sample stage with your hand and re-pressing the START key (when the warning message from the ELI function is displayed) will ensure accurate measurement results each time.

External Light Interference (Et i)

Prove Protection against Ingress of water (IP 65) >

Although the PAL-2 is water resistant and may be cleaned under running water, it is not water proof. Avoid from submerging it under water.

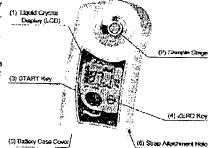
Confirmation of Package

Please confirm the following contents of the package immediately when the Unit is unpacked.

- ◆ Pocket Refractometer PAL-2-----1
- ◆ Inspection Card ------1
- ◆ instruction Manual (this book)------1

Names and Roles of Each Part

- (1) Liquid Crystal Display (LCD) Measurement values (Brix(%)) and battery power indicator are displayed on the Liquid Crystal Display. (1) Liquid Crystal
- (2) Sample Slage The prism is located at the center of the Sample Stage. The sample stage is made of stainless steel
- (3) START Key Press this Key to start measurement. Note that the measurement value goes off if this switch is kept pressed for over 2 seconds.
- (4) Zero Key Press the Zero Key at zero setting of the Unit.
- (5) Battery Case Cover
- Remove this cover to set or replace the battery.
- (6) Strap Attachment Hole A strap can be attached here.





1. Inserting Batteries

(1) Remove the battery case cover. Be sure to remove the protective tape located on the under side of the cover (Fig. 1-1).

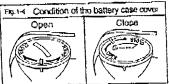


(2) in reference to the illustration located on the backside of the main body, insert the two AAA alkaline beholdes provided. Be sure to check and properly insert noting the positive and negative terminals of the tysteries (Fig. 1-2).



(3) When the battories are inserted cover so that the marking on the cover is in line with that located on the main body. Using a coin, tighten the battery case cover by turning it clockwise (Fig. 1-3, Fig. 1-4).





[CAUTION]

 An O-ring is attached to the battery caso cover. Ensure that the O-ring is clean and not deformed at all times. Dirty or deformed O-rings may allow water to enter the unit, thus damaging the electronic components inside.



 Battery Power Indicator Editory Fower Indicator
When the battery power incleator displays the minimum amount of battery power remaining (as shown in the figure), replace the batteries with new ones as soon as possible.

Use only 1.5V I_R03 AAA batteries.

- When purchasing battories be sure to check the expiration date.
- After changing batteries be sure to conduct zero setting.

2. Zero Setting

[CAUTION]

- Be sure to perform zoro solling each day before using
- If the temperature of distilled or tap water used for conducting zero selling (when placed on the prism) is higher or lower than the umbient temperature, before pressing the START key, allow some time for the temperature of the water to conform (cool down or warm up) to the temperature of the prism surface.
- * When zero setting and the ELI* function indicates the warning message [rinn] on the LCD, shade the sample stage with your hand and measure the sample again.
- (1) Prepare distilled or tap
- (2) Clean the prism surface (Fig. 2-1).



- (3) Place approximately 0.3 ml of water onto the prism surface (Fig. 2-2, Fig. 2-3).
- (4) Press the START key. The [LLL] will be displayarrow blinks 3 times
- Next, while the display indicates FLLL letter pressing the START key, press the ZERO key leaving the water (5) Next. on the prism (Fig. 2-4).
- (6) After blinking 3 times, [000.] will be displayed on the screen (Fig. 2-5).
 If the display indicates
 - [AAA] (Fig. 4-1), add more water onto the prism and press the ZERO key again.
- (7) [000] should be displayed 1 (00.) should be dispulyed after pressing the ZERO key, Indicating that the zero setting has been successfully completed. Wipe the water att the prism surface with tissue. The PAL-2 is now ready for sample measuring.









[CAUTION]

When conducting zero setting, water should be on the prism and [LLL] should be displayed on the screen after pressing the START key.

Next, press the ZERO key. If nothing is displayed on the screen, the PAL-2 will not operate when the

ZERO key is pressed.

3. Measuring a Sample

[CAUTION]

- Do not use any mobilic implements for eampling. The metal can possibly damage the prism surface.
- · If the temperature of the cample stage and that of the sample to be measured are different, allow some time for the temperature of the sample stage to conform to the sample before taking a measurement to eliminate the temperature differences.
- For measuring high-temperature samples that have been heated or boiled, put the appropriate amount of sample (approximately 0.3 ml) onto the sample stage. Press the START key. Walt for the Brix value to be displayed, and then press the START key again. Repeat until the Brix value becomes almost invariant, which may then be used as an effective measurement value. The indicated Brix value fluctuates due to the temperature difference between the sample and the prism, but will stabilize after repeating the above steps a few times.
- When measuring a sample and the ELI* function indicates the warning message [nmm] on the LCD shade the sample stage with your hand and moosure the sample again.
- (1) Clean the prism surface.
- (2) Put approximately 0.3 ml of the sample to be measured onto the prism surface (Fig. 3-1, Fig. 3-2).
- (3) Pross the START key (Fig. 3-3).
- (4) The Brix(%) value (of the sugar concentration when (notituos osorcis: is gnhuzcom will be displayed on the ecreen ufter the arrow blinks 3 times (Fig. 3·4).
- (5) The measurement value will remain displayed for approximately one minute. To lum off the display, press and hold down the START key for 2 approximately soconda.











(6) After wiping off the sample from the prism surface put some water on the prism and wipe off again. Ensure that the prism and the sample sluge are deaned by wiping with a dry lissue.



4. Error Messages

When the PAL-2 is improperly operated, an error messages is indicated on the display.

[AAA]: Zero Setting Error (Fig. 4-1)

- Indicates when the ZERO key [19.41 is pressed and there is no water on the prism.
- Indicates when the ZERO key la prossed with a substance other than water is on the prism



[LLL]: Sampling Error, Measurement Error, and Battery Error (Fig. 4-2)

- Indicates when the START key [is pressed with no sample or insufficient amounts of sample is on the prism.
- · Indicates when the sample measured has a Brix (%) value below the measurement range
- Indicates when the START key is pressed and the battery power is loo low to perform the measurement. (Continued usage will result in the display to automatically shut off.)

[HHH]: Over Range (Fig. 4-3)

 Indicates when the sample Fig. 4-3 measured has a Brix(%) value excooding the measurement range.



Ambient Temperature Error (Fig. 4-4)

When the start key is pressed and Fo. +4 the temperature of the prism is lower or approximately 10°C or approximately 40°C or higher the Brix(%) value will be displayed along with a blinking arrow. This indicates that the temperature of the prism is below or above the manufactured conditions of operation (10-40°C). When mussuring a high-temperature samples that trive tunen heated or boiled, the same message may be displayed although the temperature of the sample may be below 40°C. However, as the temperature compensation is effective up to 60°C, the stabilized Brix value acquired after taking repeated measuremonts may be used as an

effective measurement value.



5. Storage and Maintenance

- (1) When storing this instrument, avoid a damp place or a place which is exposed to the direct sunrays.

 Demoness will cause blure on the optical system or it. will gather molid, and direct surveys will deform the casing, disabling the instrument from performing measurements.
- (2) Because the casing is made of plastic, it is strictly prohibited to use organic solvents (paint thinner, benzing, gasoline or the like),
- (3) After taking a measurement, completely wipe off any sample on the surface of the prism and aumounding area, with tissue paper socked in water. Then remove any remaining moisture, completely with dry tissue paper.

6. Brix (%) and Automatic Temperature Compensation

(1) About the Brix (%) Scale
The Brix (%) shows the concentration percentage of the soluble solids content of a sample (water solution). The soluble solids content is the total of all the solids dissolved in the water, beginning with sugar, salts, protein, acids, etc., and the measurement reading value is the sum total of those. Besically, Brix (%) is calibrated to the number of grams of cane sugar contained in 100g of cane sugar solution. So, when measuring a sugar solution, it (Brix(%)) should perfectly match the actual concentration. With solutions of other components, especially when one wards to know, quantitatively, the concentration, a conversion chan is necessary.

(2) Automatic Temperature Compensation
The automatic temperature compensation of the PAL-2 is performed by the temperature sensor based on the temperature of a prism which should be from 10°C to 60°C. The temperature compensation is accurate therefore when the temperature of the sample on the prism is the same as that of the prism.

After dripping a cold or not sample on the prism, the

stabilized Brix value acquired after a few times of repeated measurements may be used as an effective measurement value.

7. Specifications

Moasument rango	Brit45.0~-03.0%
Plasokillan	Paris () 1%
Measurement accuracy	Bik±0.2%
Можения втрешье	10-40°C Automatic Temperature Compensation
Ambient temperature	₹(\$+~01
Sample volume	U (3m2 or minus
Museuming lane	3 securds
Power's supply	Size AAA alkaline balliery × Z
Buttery Mu	About 11, 000 times measurement (when an abaline biddery is used)
International Protection class	1P66
Disyberntonics and weight	55(M) X31(D) X100(H)mm, HD5

When transporting the PAL-2 on an airplane," remove the batteries and battery case cover and keep them in the storage case provided

The warranty of this instrument is one year after the date of purchase. Any trouble detected during the warranty period will be performed without charge. After the warranty has expired, the cost of repairs will be subject to evaluation. Ask your ATAGO distributor concerning this matter.

During the warranty period, if a person who has not taken the maintenance technology course at our company and has opened and tampored with the components within the casing, the warranty will be invalidated and a charge for repair will be assessed. The prism is considered a consumable item.

Therefore, any damage to the prism is not covered under the warranty and is subject to repair costs.

When asking about repair or other matters, be sure to notify us of the serial No. of your PAL-2

The product is in conformity with the requirements of the EMC Directive 93/68/EEC.

The attractive design of the Pocket has been patented not only in China and Taiwan but also around the world, Patent for the optical structure, architectorics are pending in China, Taiwan and all other countries around the

ATAGO CO.,LTD.



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