



## Introduction

Thank you for purchasing the Digital Hand-Held Urine Specific Gravity "Pen" Refractometer, PEN-Urine S.G.. Before operating, read this instruction manual carefully to understand its contents. Keep the manual with the instrument for future reference.

## Safety Precautions

To use the PEN-Urine S.G. safely, the precautions described in this instruction manual must be observed. Failure to comply may result in injury and/or damage to property.

### **WARNING**

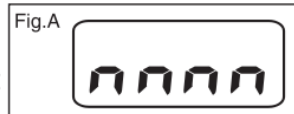
- ◇ When measuring hazardous materials, use proper safety procedures, materials, and clothing to avoid personal injury. Anyone handling hazardous materials should understand their properties and safety requirements.
- ◇ If the instrument is dropped or subjected to a strong impact, contact your supplier for inspection.
- ◇ Do not attempt to repair, modify, or disassemble the instrument.

### **CAUTION**

- ◇ If this instrument is used to measure highly acidic samples, the prism and prism head may be damaged, resulting in inaccurate measurements.
- ◇ The prism is made of optical glass. Metal tools and/or implements can damage the prism surface. If the surface of the prism is scratched or damaged, inaccurate measurements will occur.
- ◇ Before use, carefully read the instruction manual and fully understand the function and operation of the instrument.
- ◇ Use the battery specified for this refractometer. Insert the battery properly, paying attention to the polarities.
- ◇ Do not leave the instrument in a location exposed to direct sunlight or near a heat source for any extended period of time.
- ◇ Do not change the ambient temperature of the instrument suddenly.
- ◇ Do not place the instrument where it will be subject to strong vibrations.
- ◇ Do not use the instrument where there is an excessive amount of dust.
- ◇ Do not store the instrument in an extremely cool area.
- ◇ Do not set or drop heavy objects on the instrument.
- ◇ When transporting the PEN-Urine S.G. on an airplane, remove the battery.

## ELI Function

<If the ELI\* function displays the [nnnn] warning message when measuring a sample, shade the prism head with your hand and repeat measurement. (Fig. A)>



If the PEN-Urine S.G. is subjected to intense light, such as direct sunlight or artificial lighting, when measuring a sample or zero setting, the ELI function will display the [nnnn] warning message immediately after the START or ZERO key is pressed. When this happens, shade the prism head with your hand and press the START or ZERO key again.

— Note —

When intense light passes through the prism of a digital refractometer, the light waves interfere with the sensor, which may lead to inaccurate measurements. To ensure accurate measurement results, the PEN-Urine S.G. is programmed with the ELI function which displays the [nnnn] warning message when intense direct light is detected. When the ELI warning is displayed, shading the prism head with your hand and pressing the START key again will ensure accurate measurements.

\*External Light Interference (ELI)

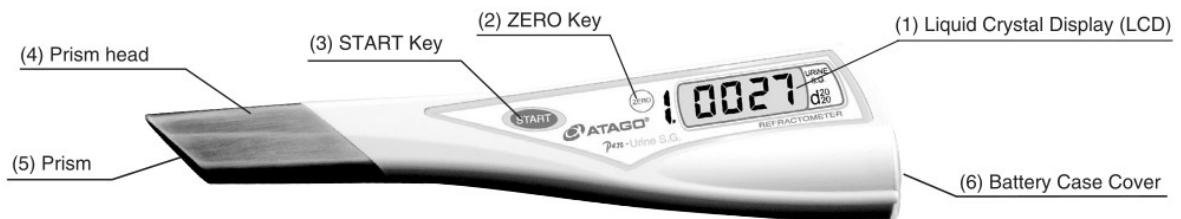
## 1.Contents

The PEN-Urine S.G. comes with the following items:

- ◆ Pen Refractometer PEN-Urine S.G. ....1
- ◆ Instruction Manual (this book) .....1
- ◆ Size AAA Battery .....1
- ◆ Storage Box .....1

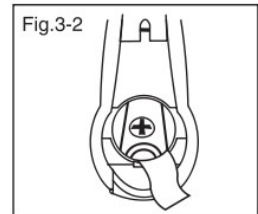
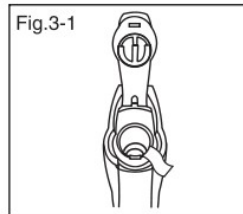
## 2.Parts

- (1) Liquid Crystal Display (LCD)  
Displays the measured values.
- (2) ZERO Key  
Press to perform zero-setting.
- (3) START Key  
Press to begin measurement.
- (4) Prism head  
The prism housing area that is dipped into samples.
- (5) Prism
- (6) Battery Case Cover  
Open the lid to insert and take out the battery.

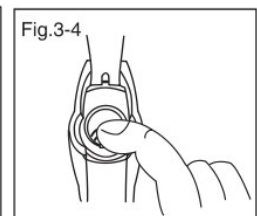
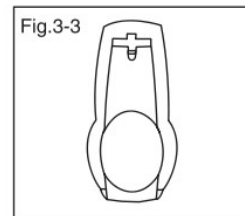


## 3.How to insert (or replace) the battery

- (1) Open the battery case cover (Fig. 3-1).
- (2) One AAA battery and a protective strip of tape are included with the instrument at purchase. Remove the protective tape from the underside of the battery case cover before use (Fig. 3-2).
- (3) Close the battery case cover. A click will indicate the cover is securely closed (Fig. 3-3).



- (4) To change the battery, open the battery case cover and depress the edge of the battery with your finger to remove (Fig. 3-4).
- (5) Insert a new AAA alkaline battery with the negative (-) terminal end in first.



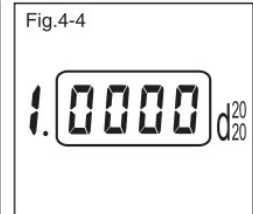
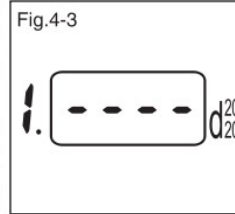
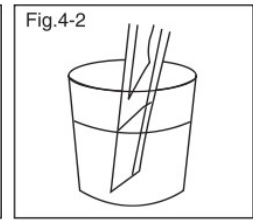
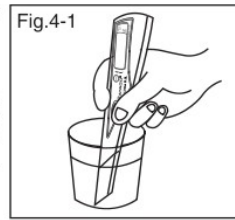
- Always check the expiration date when purchasing and inserting new batteries.
- Perform Zero Setting after replacing the battery.

## 4. Zero Setting

### [CAUTION]

- Perform Zero Setting each day prior to using the PEN-Urine S.G..
- Use distilled or tap water that is approximately the same temperature of the sample to be measured.
- If the ELI\* function displays the [nnnn] warning message while performing zero-setting, shade the prism head with your hand and press the ZERO key again.
- If the LCD screen displays [AAAA], dip the prism head in water again and press the ZERO key, ensuring the prism is not exposed to air.

- (1) Check the prism and the prism head to make sure they are free of dirt.
- (2) Prepare distilled or tap water in a clean container.
- (3) Fully submerge the prism head into the water and press the START key OR press the START key and (within 10 seconds) fully submerge the prism head into the water (Fig. 4-1) (Fig. 4-2).
- (4) The measurement value will be displayed after [----] (Fig. 4-3). If the value displayed is [0000], zero setting does not need to be performed (Fig. 4-4). Wipe the prism and the prism head clean with tissue paper, and then proceed to measuring a sample.
- (5) If the value displayed is not [0000], press the ZERO key while the prism head is submerged in water. Once [0000] stops blinking, the zero setting is complete (Fig. 4-4). Wipe the prism and the prism head clean with tissue paper, and then proceed to measuring a sample.



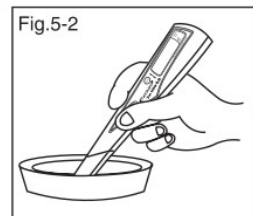
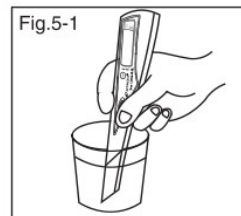
## 5. Measuring Method

### [CAUTION]

- If the ELI\* function displays the [nnnn] warning message while measuring a sample, shade the prism head with your hand and press the START key again.

Two different ways to measure a sample:

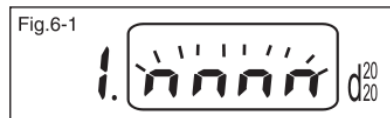
1. Dip the prism head into a sample-filled container (Fig. 5-1).
  2. For small sample volumes, touch the prism head into the sample (Fig. 5-2).
- (1) Dip the prism head into the sample and press the START key OR press the START key and (within 10 seconds) touch the prism head into the sample.
  - (2) The measurement value will be displayed after [----] (Fig. 5-3).



## 6. Error Messages

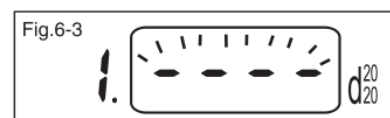
Improper operation of the PEN-Urine S.G. will result in one of the following error messages:

- ⊙External Light Interference (ELI) : The following warning message will be displayed when intense light passes through the prism.



The warning message will blink on and off for the first 10 seconds it is displayed (Fig. 6-1). While the warning message is blinking, shade the prism head with your hand to commence with the measurement. If the prism head is not shaded within 10 seconds, the warning indication will stop blinking and the START key will need to be pressed again (Fig. 6-2).

- ⊙Air Measurement Error : The following error will be displayed when the prism is exposed to air during a measurement.



When the START key is pressed, [----] will blink (Fig. 6-3). If the prism head is not adequately submerged within 10 seconds, [----] will stop blinking and the error message [LLLL] will be displayed (Fig. 6-4). The START key will need to be pressed again after adequately submerging the prism head.

©Temperature Error : The following error message will be displayed when the temperature of the prism and the temperature of the sample vary greatly.



The error message will blink on and off for the first 30 seconds it is displayed (Fig. 6-5). Keep the prism head submerged in the sample, and measurement will commence as soon as the difference in temperature is narrowed. If the temperature difference remains too wide after 30 seconds, the error message will stop blinking (Fig. 6-6). Keep the prism head submerged in the sample and press the START key again.

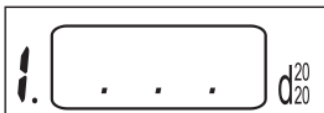
#### © Other Errors

##### • Zero Setting Error



The following error message will be displayed when the ZERO key is pressed while the prism head is exposed to air, or is submerged in a solution other than water.

##### • Out of Temperature Correction Range Error



The following error message will be displayed when measurement is conducted outside the temperature correction range of 10-35°C.

## 7. How to Turn the Power Off

The PEN-Urine S.G. will power off automatically after 2 minutes of non-use. To manually turn off the power off, press and hold the START key for 4 seconds.

## 8. Storage and Maintenance

- (1) Store this instrument in a dry and shaded area. A damp storage area may cause the optical system to malfunction or facilitate the growth of mold. Extended exposure to direct sunlight may cause the casing to warp.
- (2) Do not use organic solvents (paint thinner, benzene, gasoline, etc.) on the instrument as they will severely damage the casing.
- (3) Clean the prism surface immediately after completing each measurement. Sample left on the prism surface for an extended period of time will damage the prism. Clean the prism with water and dry any excess moisture with a clean, dry tissue.

## 9. Automatic Temperature Compensation (ATC)

The ATC feature of the PEN-Urine S.G. displays the measured value of the sample at the standard 20°C (within the measurement temperature range of 10-35°C). As the temperature of a solution changes, so does the Refractive Index. The ATC feature of the PEN-Urine S.G. is performed by a temperature sensor which measures the change in prism temperature and then calculates the actual measured value in relation to the temperature change. Since the prism temperature is changing, allow time for the temperature of the prism and sample to equalize for the ATC to work properly.

## 10. Specifications

Measurement range	Urine S.G. 1.0000~1.0600
Resolution	Urine S.G. 0.0001
Measurement accuracy	Urine S.G. $\pm 0.0010$
Measurement temperature	10~35°C (Automatic Temperature Compensation)
Ambient temperature	10~35°C
Measuring time	2 seconds
Power supply	Size AAA alkaline battery $\times 1$
Battery life	About 8,000 times measurement (when an alkaline battery is used)
International Protection class	IP65 Water Resistant (Prism head: IP67)
Dimensions and weight	160(W) $\times$ 38(D) $\times$ 18(H)mm, 70g

ATAGO's instruments are rigorously inspected to ensure each unit meets the highest standards of quality assurance.

World-wide patent and registration pending.

## 11. Repair and Warranty

The PEN-Urine S.G. is warranted for one year after the date of purchase against any manufacturer defect in materials or workmanship. Since the PEN-Urine S.G. is a precise optical instrument, great care must be taken in the instrument's storage and use. If any mistreatment or misuse of the instrument is detected, the warranty will be voided and repair fees will be charged. Ask your supplier for more details.

Have the serial number of your PEN-Urine S.G. available when asking about repairs.

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