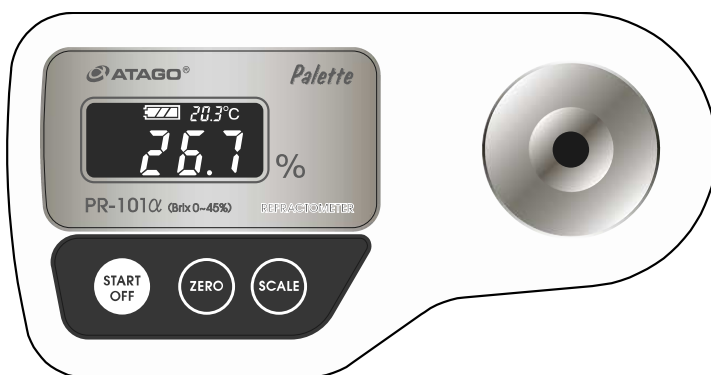


DIGITAL REFRACTOMETER

Palette Series

- PR-32 α Cat.No.3405
- PR-101 α Cat.No.3442
- PR-201 α Cat.No.3452
- PR-301 α Cat.No.3462

INSTRUCTION MANUAL



When a malfunction is suspected!
Malfunctions often come from low battery.
Check the battery first, and if the battery is low,
replace it with a new battery.

Examples of Use

Measure Brix (%) p.11

Cutting oil A

Easy Brix (%) measurement.

This instrument can be used for various samples.

“12.Methods of measurement for special samples”

 p.18)

Apply the sample



Press the START/OFF button



12.3

Brix (%)

Convert and display measurement values for a specific liquid samples p.19

[User scale function]

By setting a conversion coefficient on the instrument, a converted measurement value will be displayed.

Concentration of cutting oil A = Brix (%) x conversion coefficient

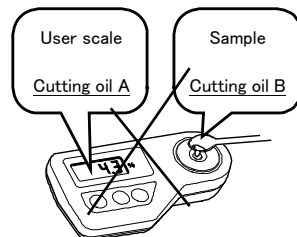


Set the scale number p.23

When multiple user scales have been set, selecting the incorrect scale will prevent the instrument from displaying the correct values.



Fix the scale to prevent it from being changed accidentally.



Correct values will not display



Caution Be sure to read this caution before using the instrument .

Durability of the body casing of this instrument

The body casing of this instrument is made of "ABS resin."

- ◇ If this instrument is exposed to steam, there is a possibility that the body casing of the instrument may crack. Therefore, keep this instrument away from steam.
- ◇ Since there is a possibility that ABS resin is damaged by the following solvents, give attention to this matter.

Solvents by which ABS resin is easy to be damaged

<ul style="list-style-type: none">▪ Aqua regia▪ Chromic acid▪ Chlorosulfonic acid▪ Hydrobromic acid▪ Nitric acid▪ Hydrofluoric acid anhydrous▪ Sulfuric acid▪ Phosphoric acid▪ Ethyl acrylate▪ Butyl acrylate▪ Ethyl acetoacetate▪ Acetophenone▪ Benzyl benzoate▪ Ethyl benzene▪ Ethylen oxide▪ Ethylene diamine▪ Ethylene chlorohydrin▪ Epichlorohydrin▪ Ethyl chloride▪ Benzyl chloride▪ Methyl chloride▪ Chlorinated solvents▪ Xylene	<ul style="list-style-type: none">▪ Cresol▪ Chloroacetone▪ Chlorotoluene▪ Chloroform▪ Acetic acid▪ Amyl acetate▪ Isopropyl acetate▪ Ethyl acetate▪ Butyl acetate▪ Propyl acetate▪ Methyl acetate▪ Diphenyl oxide▪ Diisopropyl ketone▪ Carbon tetrachloride▪ Dioxane▪ Cyclohexanone▪ Dichlorobenzene▪ Dibutyl phthalate▪ Dimeyethyl formamide▪ Dimeyethyl aniline▪ Phenol▪ Ethyl mercaptan▪ Tetrahydrofuran	<ul style="list-style-type: none">▪ Trichloroethylene▪ Toluene▪ Ethylene dichloride▪ Methylene dichloride▪ Nitroethane▪ Nitropropane▪ Nitrobenzene▪ Nitromethane▪ Perchloroethylene▪ Fluorobenzene▪ Freon▪ Methyl methacrylate▪ Methyl isobutyl ketone▪ Methyl ethyl ketone▪ Chloroacetic acid▪ Monochlorobenzene▪ Chlorine liquide▪ Thionyl chloride▪ Sodiumperoxide▪ Bromine▪ Benzine▪ Lacquer
--	--	---

Note Since there is no guarantee that ABS resin will not be damaged by some solvent other than the above ones, be careful with similar solvents.

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1. Precautions for use

Introduction

Thank you for purchasing the instrument. Before using the instrument, read this instruction manual carefully and understand how to use it.



After reading this manual, keep it on hand for future reference.

In this manual "For safe use" describes the important items necessary for safety. Read it carefully.




For safe use --- Be sure to observe the following.

This book describes the items which you are required to observe in order to use the instrument safely to prevent injury to you and other people and damage to your property. The explanation of the indications and symbols of those items are as follows. Understand them first and then read the following pages to use the instrument correctly. Read it carefully.

Explanation of indications

 WARNING	If this indication is neglected and the instrument is handled incorrectly, the user may be seriously injured and may result in death.
 CAUTION	If this indication is neglected and the instrument is handled incorrectly, the user may be injured and the user's property may be damaged.

Explanation of symbols

	This symbol denotes an item which you are warned (or cautioned) of. The contents of warning are described in detail in or near the Δ .
	This symbol denotes an action which you must not do (a prohibited item). The contents of prohibition are described in detail in or near the \bigcirc .
	This symbol denotes an action you must do. The contents of instruction are described in detail in or near the \bullet .

Handling of this instrument



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. Continued use may cause the instrument to smoke or fire.



- ◇ Do not attempt to repair, modify, or disassemble the instrument yourself. Improper servicing may result in fire, electrical shock, or burns.



Handling of this instrument (Continued)



CAUTION

◇ Do not apply water or sample over any part other than the surface of the prism.
Application on any other part of the instrument may result in a malfunction.



◇ If this instrument is used to measure very hot or highly acidic samples, the prism may be damaged 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.



◇ After taking a measurement, completely wipe off any sample on the surface of the prism and surrounding area with tissue paper soaked in water. Then remove any remaining moisture completely with dry tissue paper.



◇ If you have measured a sample of polymer or fats and oils, wipe it off with tissue paper soaked in alcohol or neutral detergent. Then remove any remaining moisture completely with dry tissue paper.



◇ When transporting the instrument, place it in its original box.



◇ When measuring in an area where direct light and/or strong outdoor sunlight is present, the ELI warning message [nnn] may be displayed.
If warning message is displayed, cover the sample stage of the unit and press the START/OFF Button again to take another measurement.



- ◇ Carefully read this book and fully understand the function and operation of each part of the instrument before use.
- ◇ Check that each part of the instrument operates normally before use.
- ◇ Check the necessary operations such as zero setting according to the instruction manual.
- ◇ The manufacturer shall not be held responsible for any or all damages as a result of use of the instrument for those other than its intended purposes (measurement of Brix, sugar content, concentration of liquid).
- ◇ The prism mounted on the sample stage that is in contact with a sample under measurement is a consumable item.
- ◇ Ensure that if use of the instrument has undesired effects on the consumption of the measured materials, etc., ATAGO shall not be held responsible for the result.

Handling of battery



WARNING

- ◇ Make sure to use a specified battery or that supplied with the instrument as an accessory. When loading the instrument with a battery, pay heed to the polarities of the battery. If a battery out of the specification is used, it may cause smoke or fire because some batteries are different in the voltage and polarities.
- ◇ Do not heat, shortcircuit, burn a battery or take it apart. If done so, it may cause burst or fire.



CAUTION

- ◇ Be sure to always use alkaline batteries.
- ◇ When keeping or disposing a battery, protect both poles with insulating tape, etc. If a battery is kept or disposed as the poles are not covered, it may cause shortcircuit, burst or fire.



Items to be observed when using

Environmental conditions

- ◇ Use the PR-32 α and PR-101 α where the temperature is between 5 to 40°C.
- ◇ Use the PR-201 α and PR-301 α where the temperature is between 10 to 40°C.
- ◇ Use the instrument where the humidity is below 90%RH.
- ◇ Do not leave the instrument in a location exposed to direct sunlight or near a heating unit where the temperature may rise.
- ◇ Do not change the environmental temperature of the product suddenly.
- ◇ Do not place the instrument in a place where it may be subject to strong vibrations.
- ◇ Do not use the instrument where there is much dust.
- ◇ Do not leave the instrument where the temperature is extremely low.
- ◇ Do not leave the instrument in a damp place.
- ◇ Do not place or drop heavy objects on the instrument.

Handling

- ◇ Do not drop the instrument or subject it to any strong shock.

Daily maintenance

- ◇ If the instrument becomes dirty, wipe it with a soft cloth.
- ◇ Do not use benzine, paint thinner, etc. to clean the instrument.

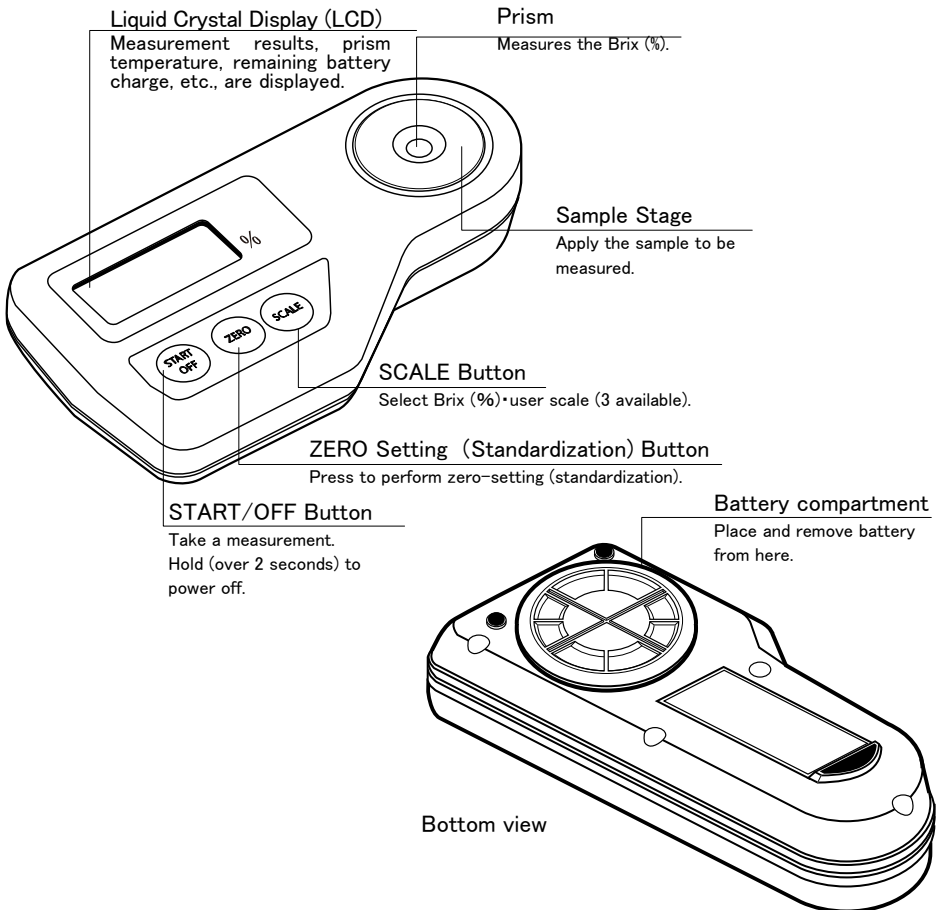
2. Confirmation of package

Please confirm the following contents of the package when the unit is unpacked.

- Main unit 1
- 006P Alkaline Battery (9V)..... 1
- Instruction Manual (this book)..... 1
- Standard Liquid (only PR-301 α)..... 1

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

3. Names and roles of each part

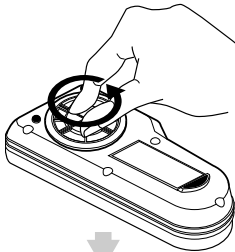


4. Inserting the battery

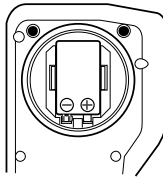
CAUTION

- ◇ When loading the instrument with a new battery, carefully do not make a mistake in connection of the positive (+) and negative (-) poles of the battery. If they are wrongly connected, it causes a trouble or damage of the refractometer.
- ◇ When closing the battery cover after replacing the battery, make sure not to turn it with the screwdriver supplied together with the instrument but to do it with fingers, If the screwdriver is used to close the battery cover, it may be closed too tightly and the cover may be hard to open again.
- ◇ Electronic circuits of the unit turns on as soon as the battery is set. Thus, there is no power button on this unit.
- ◇ When the voltage of the battery is low after some time, purchase a new 006P alkaline battery and replace the old battery with the new one. Be sure to carry out zero setting when the battery is replaced.
 - * When purchasing a battery, be sure to check the expiration date.
- ◇ Remove the battery from the unit when the unit is not to be used for a month or longer. Failure to remove the battery before prolonged storage may result in leakage.

Remove the lid of the battery compartment.



Insert the battery.



Note

Do not mistake the + and - terminals.

Close the lid with your bare hand.



5. Zero setting (In case of PR-32α, PR-101α, PR-201α)

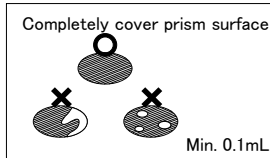
CAUTION

- ◇ The refractometer needs the "zero setting" (calibration) before it is used for the first time in a day. Moreover, if the ambient temperature changes during the daily work with the refractometer, it needs the zero setting again.
- ◇ The zero setting is also needed whenever the battery is replaced.
- ◇ Do not use any metallic implement for dropping water on the prism because the metal tool possibly damages the prism surface.

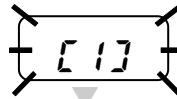
Clean the prism surface thoroughly.



Apply tap water.



Press the START/OFF Button.



Flashes 3 times



Measurement value is displayed

Confirm zero-setting

Measurement: 0.0%



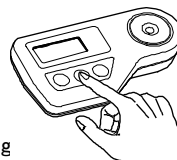
Zero-set correctly.

Measurement: not 0.0%

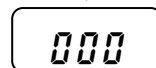


Perform zero-setting

Press the ZERO Setting Button.



Flashes 3 times



000 is displayed.

Zero setting is complete.

6. Standardization (In case of PR-301 α)



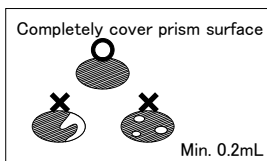
CAUTION

- ◇ Perform standardization with a standard liquid in a 18~25°C environment.
- ◇ When the refractometer is used for the first time after purchase or the battery is replaced, make sure to perform the "zero setting"(standardization) for the refractometer.
- ◇ Do not use any metallic implement for putting a round sheet or the like on the prism because the metal tool possibly damages the prism surface.

Clean the prism surface thoroughly.



Apply the standard liquid.



Press the ZERO Setting (Standardization) Button.



Flashes 3 times



000 is displayed.

Clean the prism with alcohol.



7. Measurement



WARNING

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



CAUTION

- ◇ Do not use any metallic implement for sampling because the metal tool possibly damages the prism surface.
- ◇ Do not apply water or sample over any part other than the surface of the prism. Application on any other part of the instrument may result in a malfunction.

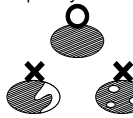
Clean the prism surface thoroughly.



Apply a sample.

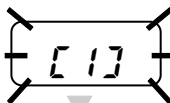


Completely cover prism surface



Min. 0.1mL

Press the START/OFF Button.



Flashes 3 times



Measurement value is displayed
Example: PR-101 α

MEMO

Refer to "12.Methods of measurement for special samples" (p.18) when measuring special samples (such as hot or high viscosity samples).

8. About Data Transmission Function

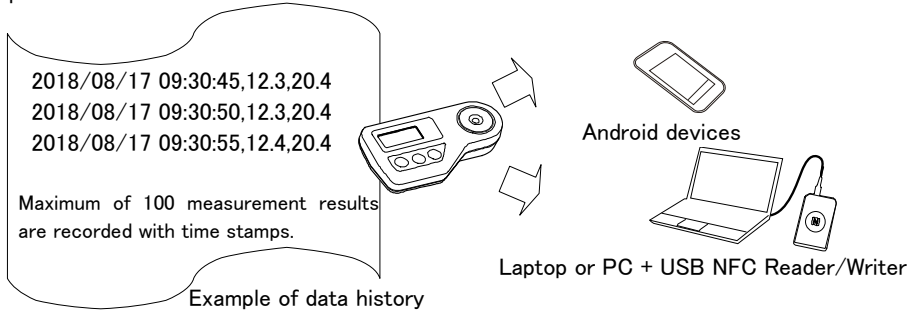
⚠ CAUTION

- ◇ When the history of measured data reaches 100, no further measurements can be taken unless all 100 records are deleted.
- ◇ The data transmission function can be set to ON / OFF.

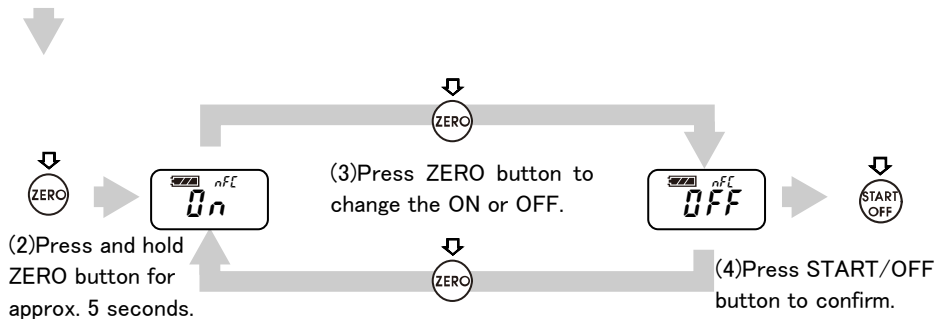
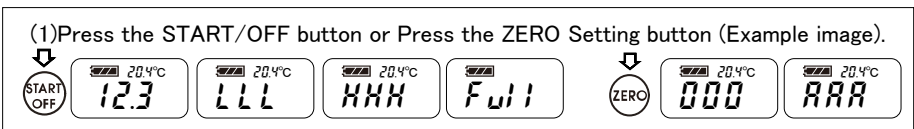
8-1. Introduction

This instrument stores maximum number of 100 measurement data. This instrument is equipped with NFC (Near Field Communication) technology. Data history can be accessed by bringing PR-NFC to any Android devices or PC-linked USB NFC Reader/Writer* (in conformance to PC/SC specification).

* Operation tested with SONY USB NFC Reader PaSoRi RC-S380.



8-2. How to turn ON/OFF the data transmission function.



8-3. Software installation

Android devices

Applicable Application Software (app) "NFC Reader"



* If an NFC tag reader app is already installed on the Android devices, this app can be used.

Laptop or PC + USB NFC Reader/Writer

Data history can be exported to Microsoft(R) Excel (R)(for Windows(R)) using a NFC software "ATAGO Logger (NFC)."

* The app "ATAGO Logger (NFC)" is available for download :

<http://www.atago.net/ur/>



Example of data history read out

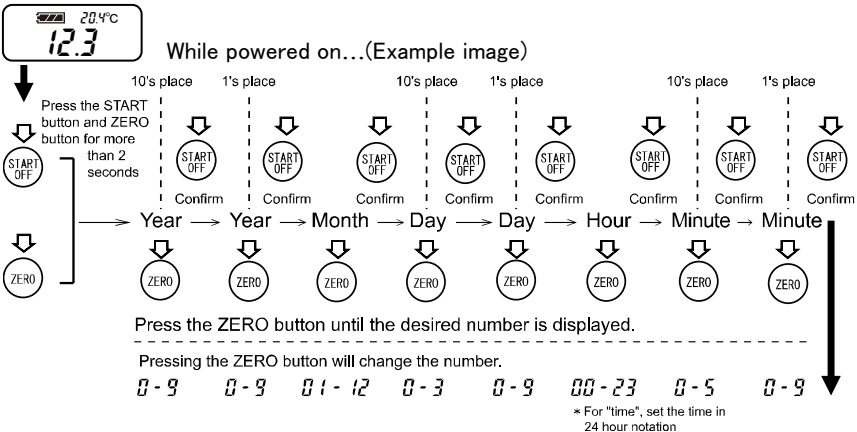
2017/8/17 9:30	LLL	20.5
2017/8/17 9:31	12.3	20.4
2017/8/17 9:32	12.3	20.4
2017/8/17 9:34	AAA	20.4
2017/8/17 9:43	OOO	20.4
2017/8/17 9:43	OOO	20.3
2017/8/17 9:45	26.9	20.3
2017/8/17 9:46	26.9	20.1

LLL : Lower limit error.
 HHH : Upper limit error.
 OOO : Zero setting complete.
 AAA : Zero setting error.
 nnn : External light error.

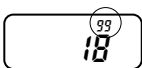
8-4. Date and time setting

Set the date and time (year [the last two digits of the western calendar], month, date, time and minute) prior to data history readout.

Reset the date and time when batteries are removed for 24hours or more.



Top right screen display during date and time set up



Year : 99 Month : 12 Day : 31

Hour : 24 Minute : 50



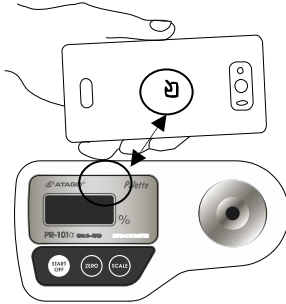
(Seconds : Fixed 00)

8-5. Data history readout

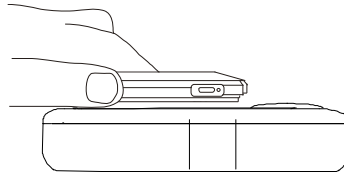
Android devices



1. Launch NFC Reader (or other NFC tag reading app).
2. Position NFC on Android device to the 'Palette' logo at the center portion of the this instrument then bring in contact.



* Do not move it.
(Hold for 1 second or more.)



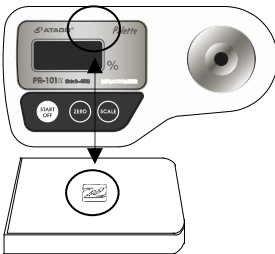
All recorded data stored in this instrument are read out.

* NFC position on Android device differs to the move.

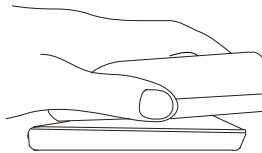
* If data history is not read out, bring both in contact and move the one that is over the other device in a forward and back or left and right in a small motion.

Laptop or PC + USB NFC Reader/Writer

1. Launch ATAGO Logger.
2. Bring the center part (where the 'Palette' logo is) of this instrument in contact with the NFC mark on the IC card reader/writer.



* Do not move it.
(Hold for 1 second or more.)



All recorded data stored in this instrument are read out.

* Be sure to establish the PC and IC card reader/writer connection in advance by setting up (and installing the driver) IC card reader/writer.

* Data history can be read out by holding up the USB NFC Reader/writer to this instrument.

* If data history is not read out, bring both in contact and move the one that is over the other device in a forward and back or left and right in a small motion.

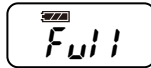
Note Bring this instrument and Android devices or this instrument and USB NFC Reader/writer as close to each other as possible. (Position it so that the distance between both devices are 5mm or less.)

memo Data history can be read out while this instrument is powered off.

memo Data history readout will not delete the stored data history.

8-6. Delete data history

All data history will be deleted from this instrument.



Note Deleted data history can not be restored.

Note When the history of measured data reaches 100, no further measurements can be taken unless all 100 records are deleted.

memo A data history can not be selected.

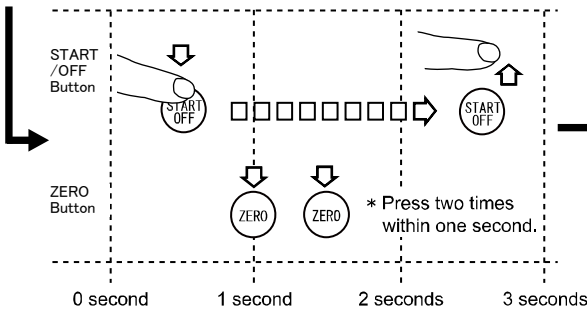
1. Quickly (3 seconds or less) do the following Button operation.

(a) While pressing the START/OFF Button, press the ZERO Button two times.

(b) Quickly release the START/OFF Button.



While powered on...(Example image)



If not deleting the data history.

Press the ZERO Button.

2. Press the START/OFF Button.



End without deleting the data history.



Delete data history

9. Powering off

The instrument will turn itself off after approximately 2 minutes of inactivity. To manually turn it off, hold down the START/OFF Button for more than 2 seconds.



10. Error messages

* Please refer to "13-7. Error message" (p.22) for the user scale functional-related error message display.

The instrument alarms erroneous or incomplete operation by error messages. The followings are kinds of error messages.

Zero setting (Standardization) error



- Water (standard liquid) is not dripped on the prism surface and zero setting (standardization) is made in a state of the prism surface being exposed to the air.
- Zero setting (PR-32 α , PR-101 α , PR-201 α) is made with a sample.
- Standardization (PR-301 α) is made with a sample or water.

".." Standardization temperature error



- The prism of the PR-301 α is below approx. 18°C, or is above approx. 25°C during standardization.

Low range over error/Sampling error



- A liquid of low concentration exceeding the measuring range is measured.
- No sample exists on the prism surface or measurement is made in an incomplete condition.

Temperature measurement range "Low Range Over Error"



※ 12.3 is an example of a measured value.

- The temperature detected is lower than the measurement temperature range.

PR-32 α	approx. 4°C or below
PR-101 α	
PR-201 α	approx. 9°C or below
PR-301 α	

High range over error



- A liquid of high concentration exceeding the measuring range is measured.

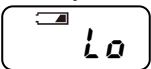
Temperature measurement range "High Range Over Error"



※ 12.3 is an example of a measured value.

- The temperature detected is higher than the measurement temperature range (approx. 41°C or above).

Battery error



- The battery is low.
 - Replace the battery with new one.
 - ※ Immediately before the battery is used up, the instrument may, perform erroneous operation, without displaying the error message "Lo". In such a case, replace the battery with new one.

External light interference



- Too much light is entering the prism, and the instrument cannot measure accurately.
 - Shade the sample stage with your hand and take a measurement again.
- When the battery is low, "nnn" may be displayed.

11. Display unit of the instrument

The instrument designed to measure concentration of liquid using the refraction of light. The "Refractive Index" is a unit which expresses the refraction of light. Individual substances have a value of Refractive Index of their own and the following substances have a value of Refractive Index at 20°C as shown below.

- Air1
- Water1.33299
- Salad oil.....1.47
- White plate glass1.52
- Diamond2.55

The Refractive Index of water solution increases gradually from 1.33299 of water as dissolved components increase. Scales of the instrument are set up by unit of weight % of sucrose dissolved in water. This is called Brix(%) (Brix (percentage)). If 10g sucrose is dissolved in 90g water, for example, this solution is expressed by Brix 10%. There exists a fixed relation between this Brix(%) and the aforementioned Refractive Index and the relative expression is determined by ICUMSA (International Committee of Uniform Method of Sugar Analysis). Based on this relative expression, the instrument converts the Refractive Index of sample (measured result) to Brix(%) and display its value.

Table 11-1 Table of Refractive Indexes and Brix(%)

1974 ICUMSA

%	n_D^{20}	%	n_D^{20}	%	n_D^{20}	%	n_D^{20}	%	n_D^{20}
0	1.33299	20	1.36384	40	1.39986	60	1.44193	80	1.49071
1	1.33442	21	1.36551	41	1.40181	61	1.44420	81	1.49333
2	1.33586	22	1.36720	42	1.40378	62	1.44650	82	1.49597
3	1.33732	23	1.36889	43	1.40576	63	1.44881	83	1.49862
4	1.33879	24	1.37060	44	1.40776	64	1.45113	84	1.50129
5	1.34026	25	1.37233	45	1.40978	65	1.45348	85	1.50398
6	1.34175	26	1.37406	46	1.41181	66	1.45584	86	1.5067
7	1.34325	27	1.37582	47	1.41385	67	1.45822	87	1.5094
8	1.34477	28	1.37758	48	1.41592	68	1.46061	88	1.5121
9	1.34629	29	1.37936	49	1.41799	69	1.46303	89	1.5149
10	1.34782	30	1.38115	50	1.42009	70	1.46546	90	1.5177
11	1.34937	31	1.38296	51	1.42220	71	1.46790		
12	1.35093	32	1.38478	52	1.42432	72	1.47037		
13	1.35250	33	1.38661	53	1.42647	73	1.47285		
14	1.35408	34	1.38846	54	1.42863	74	1.47535		
15	1.35568	35	1.39032	55	1.43080	75	1.47787		
16	1.35729	36	1.39220	56	1.43299	76	1.48040		
17	1.35891	37	1.39409	57	1.43520	77	1.48295		
18	1.36054	38	1.39600	58	1.43743	78	1.48552		
19	1.36218	39	1.39792	59	1.43967	79	1.48811		

12. Methods of measurement for special samples

(1) High/low temperature samples

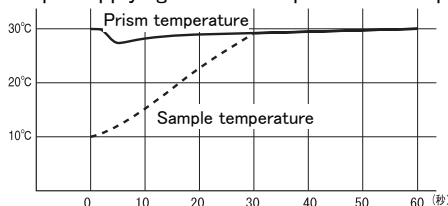
This instrument is equipped with a temperature sensor under the prism and it detects the temperature of the prism for automatic temperature compensation.

In case of the Table 12-1, it takes about 30 seconds until the sample temperature becomes approximate to the prism temperature as shown at right. If this sample is

measured within 30 seconds after it is dripped on the prism surface, the measurement may result in an error due to temperature difference. Although this instrument automatically compensates sample temperature by the function of the built-in temperature sensor and it indicates a compensated value in Brix(%), this instrument fails in temperature compensation if there is a considerable difference between the sample temperature and prism temperature.

Table 12-1: Changes in prism and sample temperature

Example: Applying a 10°C sample to a 30°C prism



Method of Measurement

1 Apply a sample on the prism surface.

2 Depending on the difference in temperature, allow the sample to sit for 20 to 60 seconds (to acclimate to the instrument's temperature).

memo Gently stirring 3 to 4 times with a plastic spoon will allow the sample to acclimate more quickly.

3 Press the START/OFF Button.



(2) High viscosity sample

Examples: Thick sauce, ketchup, jam, honey and syrup (high fructose corn syrup).

Be sure to stir of high viscosity sample well to make it homogeneous before applying it to the prism surface, or measurement values of such sample will be poor in reproducibility and it may become difficult to identify a correct value.

Method of Measurement

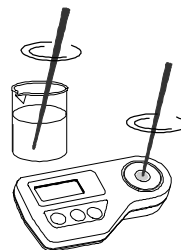
1 While stirring, transfer about 10mL of sample to a separate container (cup or beaker).

2 Apply the sample to the prism after mixing further.

memo Place an adequate amount of sample.

memo Air may be trapped between the sample and the surface of the prism. Stir 4 to 5 times using a plastic spoon.

3 Press the START/OFF Button.



(3) Semisolid sample

Examples: Agar cake and jelly

Semisolid samples such as agar cakes and jelly have poor surface contact with the prism. Placing such samples on the prism as-is may result in unrepeatable measurement values.

Method of Measurement

1 Place a semisolid sample on the prism surface.

2 Gently press the sample with a plastic spoon to the prism for better adherence.

3 Press the START/OFF Button.



13. User scale function

13-1. Introduction

This instrument can display and button between 4 scales.

Scale 1 is Brix (%).

Scales 2, 3, and 4 are user scales.

User scales use an offset function to calculate the converted concentration from the Brix value and directly display that value for various samples, such as water-soluble liquids used in metalworking, cleaning fluid, or various medicines, and other industrial liquids.

scale name	scale number	sample name	a: coefficient (multiplication)	b: addition/subtraction number
Brix (%)	1			
User scale	2			
User scale	3			
User scale	4			

memo After setting the user scale, the information can be documented in the above chart as follows.

Example:

scale name	scale number	sample name	a: coefficient (multiplication)	b: addition/subtraction number
Brix (%)	1			
User scale	2	Cutting Oil A	2.50	0.00
User scale	3	Cutting Oil B	1.87	2.00
User scale	4	Cutting Oil C	0.94	0.00

13-2. Offset Function

The relationship between a user scale (concentration) and Brix can be defined as:

"User scale (concentration) value

$$= a: \text{coefficient (multiplication)} \times \text{Brix value} + b: \text{addition/subtraction number}$$

As for the relationship between Brix and the user scale (concentration), the condition should be that the Brix and concentration are both graphically a linear line (0.0% of Brix 0.0% = concentration). The display of -99.9 to 99.9 is possible for a user scale.

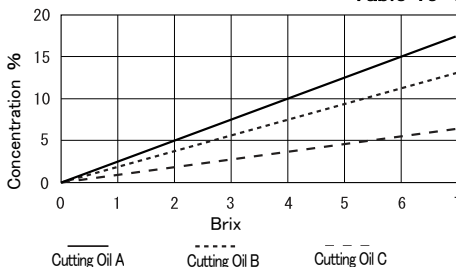
<How to obtain a conversion coefficient>

Example:

- Use a known liquid sample. For example, if 10% of concentration is commonly used, prepare a sample liquid of 10.0% of concentration.
- Measure the sample above using the Brix scale. The measured Brix value of this liquid, for example, is 4.0.
- Using the formula:

$$\text{User Scale (concentration) value} / \text{Brix value} = \text{conversion coefficient}$$
 Thus, $10.0 / 4.0 = 2.50$.
 The coefficient (multiplication) 'a' is 2.50.

Table 13-1

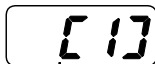


13-3. How to release the scale lock

At the time of shipment the scale is set to Brix.

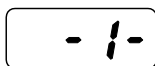
When setting a conversion coefficient, release the scale lock.

Press the SCALE button.



[1] is displayed.

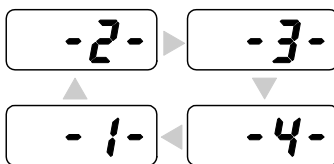
Press the ZERO setting button and START/OFF button simultaneously.



-1- is displayed.

Release the scale lock

Each time the SCALE button is pressed, the scale number changes sequentially.



memo "13-9.How to lock the scale" (☞ p.23)

memo The above describes, for example the case where the lock is released for the first time after purchase. When another scale number chosen and it is already locked, another number other than "[1]" or "-1-" will be displayed.

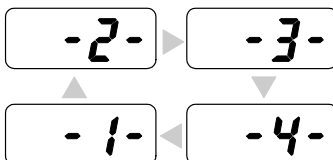
13-4. How to select the scale

memo Perform while the instrument is powered off. "9. Powering off" (☞ p.16)"

memo When the scale number is locked, release the scale lock.

"13-3.How to release the scale lock" (☞ p.20)

Press the SCALE button until the desired scale number is shown.



13-5. How to set a Offset Function

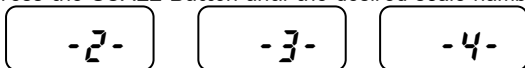
The Offset Function can be used to multiply/add/subtract a fixed value to the instrument values. Setting values for "a" and "b" in the equation "y=ax + b" will enable the instrument to display adjusted values.

$$y=ax + b$$

y: adjusted value a: coefficient (multiplication)
 x: Brix value b: addition/subtraction number

●Select the scale

1) Press the SCALE Button until the desired scale number is shown.



memo Perform while the instrument is powered off. "9. Powering off" (p.16)

memo When the scale number is locked, release the scale lock.

"13-3.How to release the scale lock" (p.20)

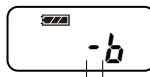
●For addition/subtraction (b) [Range: -9.99 to +9.99]

2) Press and hold ZERO Button for approx. 5 seconds.

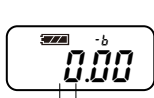
3) Press ZERO Button to select either "+" or "-."

4) Press START/OFF Button to confirm.

5) Enter the addition/subtraction number.



No plus sign will be displayed.



The 1st digit:
 ZERO Button to change the number.
 [0, 1, 2, ..., 8, 9, 0, 1, 2...]



The 2nd digit:
 ZERO Button to change the number.
 [0, 1, 2, ..., 8, 9, 0, 1, 2...]

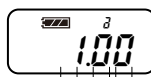


The 3rd digit:
 ZERO Button to change the number.
 [0, 1, 2, ..., 8, 9, 0, 1, 2...]

6) Press START/OFF Button to confirm. The set number will flash three times and proceed to coefficient (a) settings.

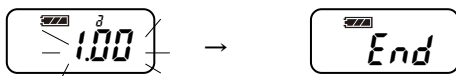
●For coefficient (a) [Range: 0.01 to 10.00]

7) Enter the coefficient (refer to step 5)).



1st 2nd 3rd

8) Press START/OFF Button to confirm.



memo To disable the Offset feature, set the Offset value to factory default value (a: 1.00, b:0.00).

memo The measurement range is shifted according to the offset settings.

13-6. How to measure

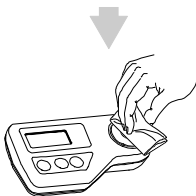
Press the SCALE button to confirm the scale number.



or

Example: Scale number 2

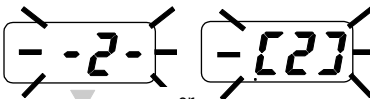
Clean the prism surface thoroughly.



Apply a sample.

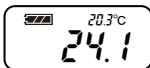


Press the START/OFF Button.



Flashes 3 times

or

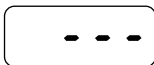


Example: measurement value display

memo Once the scale number is selected, the scale will remain selected even after the display is turned off. Once the scale is selected, it is not necessary to select it again.

13-7. Error message

Concentration display range over error



- When using a user scale, the converted concentration display exceeds 99.9.

※ For more error messages, reference "10.Error messages" (👉 p.16).

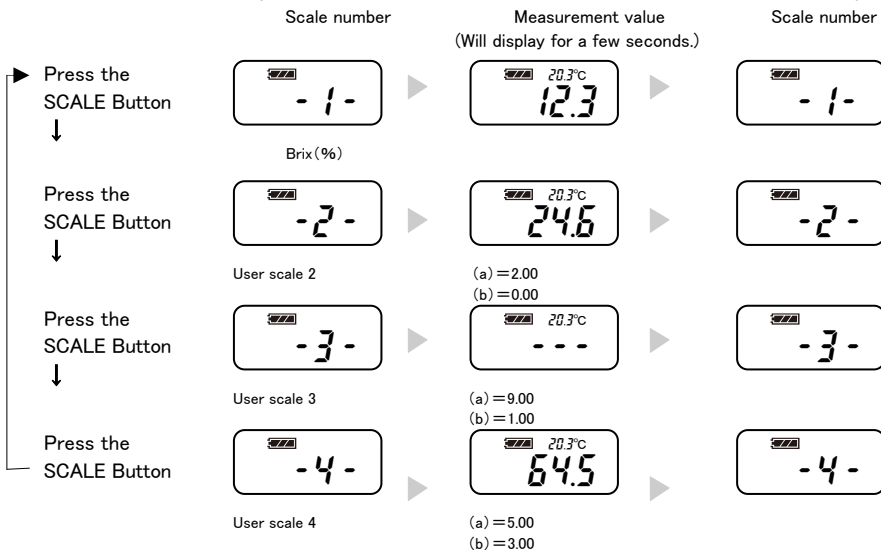
13-8. How to change the scales

After taking a measurement, it is possible to button to the measurement values of other scales.

memo If the scale number is locked, release the scale lock.

"13-3.How to release the scale lock" (👉 p.20)

When the SCALE Button is pressed, the scale number and measurement value will be displayed.

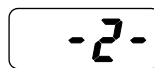


memo If the START/OFF Button is pressed, it will begin taking a measurement.

13-9. How to lock the scale

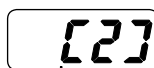
When continuously using one scale out of the four possible scales, locking the scale number is recommended.

Select the scale.
"13-4.How to select the scale" (👉 p.20)



Example: -2- is selected

Press the ZERO setting button and START/OFF button simultaneously.



Scale is locked

14. Inspecting this instrument

Inspect the instrument to see if it displays the measured value correctly. Perform the inspection periodically, e.g. once a month, also when the main unit of the instrument was subjected to a strong impact or vibration or a measured value is different from the usual measurement. For the inspection, use the standard sucrose solution besides purified water and the standard liquid. Standard sucrose solutions are available from ATAGO.

Part No.	Name
RE-110010	Sucrose Solution 10% ($\pm 0.03\%$)
RE-110020	Sucrose Solution 20% ($\pm 0.03\%$)
RE-110030	Sucrose Solution 30% ($\pm 0.03\%$)
RE-110040	Sucrose Solution 40% ($\pm 0.04\%$)
RE-110050	Sucrose Solution 50% ($\pm 0.05\%$)

Inspection of the instrument with standard sucrose solution

- ① Prepare the instrument and perform the operation before starting measurement (according to the instruction manual).
- ② Using purified water left at room temperature, perform zero adjustment correctly.
✳ For the PR-301 α , use the standard liquid included with the instrument and calibrate the instrument in an environment between 18 to 25°C.
- ③ Measure the Brix of the standard sucrose solution (about 5 times repeatedly).
- ④ If the deviation of the value of the standard sucrose solution indicated by the instrument is $\pm 0.1\%$, the operation of the instrument is normal. If the deviation is $\pm 0.2\%$ or larger, check the purity of the sucrose, method of preparation of the sucrose solution, measuring method, etc., then repeat the inspection.
- ⑤ If the deviation is still $\pm 0.2\%$ or larger, contact your ATAGO distributor.

✳ How to make standard sucrose solution (20.0%)

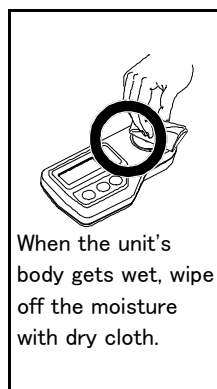
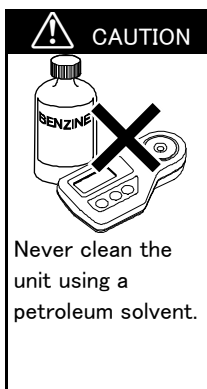
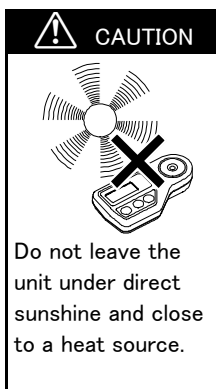
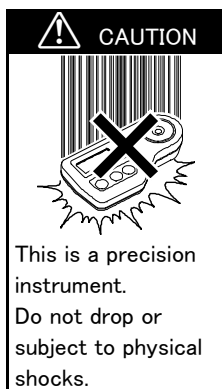
Use the following steps to make a standard sucrose solution.

Note Make standard sucrose solution at a temperature of 20°C \pm 5°C.

Note 10.0%, 30.0%, 40.0%, and 50.0% sucrose solutions can also be made by using the same procedure and changing the ratios. To inspect the PR-301 α , prepare a 50.0% sucrose solution (when making a sucrose solution of 50.0%, stir the solution well so that the sucrose will be completely dissolved).

- ① Items to be prepared
 - 20g of sucrose of special grade
 - 80g of purified water
 - Direct-reading balance (Weighing capacity: Min. 200g, Accuracy: $\pm 0.005\text{g}$)
 - 100mL beaker (Made of glass or polyethylene)
 - Spoon (Made of plastic)
- ② Procedure
 - Place the beaker on the balance and set the indication of the balance to 0.00g.
 - Put 20.00g of sucrose in the beaker.
 - Add 80.00g of purified water to the sucrose so that the total weight will be 100.00g.
 - Take down the beaker from the balance and stir the mixture well until all the sucrose is dissolved.
- ③ Precautions for making the standard sucrose solution
 - The unit of Brix of the refractometer is weight/weight%.
 - The sucrose solution should be made so that its total weight will be 100% (If the total weight is less than 100g, the relative error is increased).
 - Keep the prepared sucrose solution in a sealed container.
 - Purchase sucrose from a reagent shop, drug store or pharmacy.

15. Storage and maintenance



16. Specifications

	PR-32 α	PR-101 α	PR-201 α	PR-301 α
Cat.No.	3405	3442	3452	3462
Measurement Range	Brix0.0 to 32.0%	Brix0.0 to 45.0%	Brix0.0 to 60.0%	Brix45.0 to 90.0%
Minimum Indication	Brix0.1%			
Measurement Accuracy	Brix \pm 0.1% (5 to 40°C)		Brix \pm 0.1% (10 to 40°C)	Brix \pm 0.1% (10 to 30°C)
Measurement Temperature	5 to 40°C Automatic Temperature Compensation		10 to 40°C Automatic Temperature Compensation	
Ambient Temperature	5 to 40°C		10 to 40°C	
Sample Volume	0.1mL or more			
Measurement Time	3 seconds (approximately)			
Backlight	The backlight stays on for 30 seconds after any Button is pressed.			
Output	NFC Forum Type 4 Tag ISO/IEC 14443 Type A Output category : Date Time, Brix [%] or adjusted value, Temp [degC] yyyy/mm/dd_HH:MM:SS,xxxxxx,xxxxxx (e.g.)2018/08/17_09:30:45,_12.3,_20.4			
Power Supply	006P Alkaline Battery (9V)			
International Protection Class	IP 65 Water Resistant			
Dimensions and Weight	17(W) \times 9(D) \times 4(H)cm, 270g			

The product is in conformity with the requirements of the EMC Directive 2004/108/EC.

17. Repair and warranty

The instrument is a complicated precision electronic instrument consisting of optical (prism and objective lens) and electronic parts. Since light and electricity are combined in the operation of this instrument, their mutual actions may make it difficult to isolate operational problems. For this reason, repair and adjustment can be complicated and each serviceman is required to have special knowledge of optics and electrical engineering. Do not disassemble or perform any repair on the unit other than the basic inspection and replacement of parts described in this instruction manual (unless you have taken the maintenance technology course in our company and has been certified).

The instrument is warranted for two years after the date of purchase against any manufacturer defect in materials or workmanship. Prism and sample stage are excluded from the warranty. Any of the following events happening to the unit will void the warranty:

- Disassembled by anyone other than authorized service provider
- Immersed in liquid or dropped
- Misused, abused, or used/stored in improper ambient conditions
- Issues caused by battery leakage when using batteries other than the included

Service fees are applicable for repairs after the warranty period expires. Contact an authorized ATAGO Service Center or the original seller for details.

● Performance parts for repair

ATAGO will endeavor to secure the performance parts for repair up to seven years after manufacturing of this instrument is discontinued. Performance parts are those which are necessary to maintain the operation of this instrument. However, ATAGO may not be able to supply all parts due to discontinuation or modifications by our parts manufacturers.

Please understand this matter. Performance part are available through your ATAGO distributor.

● Recommendation of periodic inspection and maintenance (Charged)

We recommend to have your refractometer inspected periodically (once in two years, or so) to ensure years of dependable and accurate use.

Ask your ATAGO distributor for the periodic inspection (charged).

- Periodic inspection includes:
 - ◆ Inspection, confirmation, and replacement of performance parts
 - ◆ Inspection and adjustment of span

ATAGO CO., LTD.

When asking about repair or other matters, be sure to notify us of the serial No. of your refractometer.
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ATAGO INDIA Instruments Pvt. Ltd.

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ATAGO RUSSIA Ltd.

TEL: 7-812-777-96-96 info@atago-russia.com

ATAGO NIGERIA Scientific Co., Ltd.

TEL: 234-707-558-1552 atagonigeria@atago.net

ATAGO KAZAKHSTAN Ltd.

TEL: 7-727-257-08-95 info@atago-kazakhstan.com