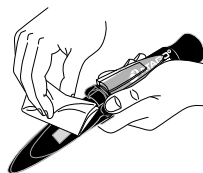


## 9. Precautions

- ① Make sure of the sort of the liquid cooling media (propylene glycol or ethylene glycol) first, and measure its freezing point with the proper scales.
- ② The refractometer should be stored in its carrying case in a dry environment (0 to 40°C).
- ③ Do not leave the refractometer in direct sunshine.
- ④ Hold the refractometer between your fingers. Do not wrap your hand around the grip.
- ⑤ Never splash water on the unit.
- ⑥ Wipe the sample off with a wet tissue.
- ⑦ The prism and daylight plate should be completely clean before sampling. If the refractometer is used to measure an oil-based or similar type sample, a residue or film may be left on the prism. In this situation, wipe the prism surface with ethyl alcohol or diluted neutral detergent to clean off any remaining sample.
- ⑧ Be careful to not scratch the prism surface. After use, clean the prism surface and daylight plate with a soft cloth soaked in water and wipe the moisture off remove any remaining moisture with a dry cloth.
- ⑨ The refractometer is a precise and sensitive optical instrument. Do not drop or subject to strong shock or excessive force.



※ Never splash water on the unit.



※ After each measurement, wipe the sample off the prism, daylight plate, and around the prism area with a soft moist tissue.

## 10. Repair and warranty

The MASTER-BC is warranted for one year 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

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

Have the serial number of your refractometer available when asking about repair.

## 11. Specifications

MASTER-BC (Cat.No.2931)	
Measurement range	<ul style="list-style-type: none"> <li>• Freezing temperature scale</li> <li>Propylene glycol : 0°C to -50°C Ethylene glycol : 0°C to -50°C</li> <li>• Battery fluid d<sub>20</sub><sup>20</sup> : 1.150 to 1.300</li> </ul>
Minimum scale	Freezing temperature scale : 5°C Battery fluid d <sub>20</sub> <sup>20</sup> : 0.01
Size and weight	3.2 × 3.4 × 16.8cm, 90g

Design Registration No.000379326-0001, 000379326-0002 (EU), ZL 2005 3 0116403.4,5 (China), D111526 (Taiwan), D554, 549 (U.S.A.)  
1255763, 1255764, 1255765, 1255766, 1255767 (Japan) Patent Granted in countries around the world.

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**ATAGO®**

2931-E08

The warranty period extension method 1 year → 2 years

The warranty period will be extended from 1 year to 2 years when you register customer information.  
Trouble scanning the code? Access this link <http://www.atago.net/ur/>



QR code

## INSTRUCTION MANUAL

BATTERY / COOLANT CHECKER

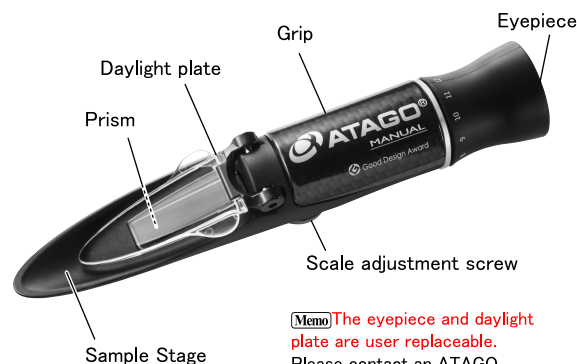
*Master* **MASTER-BC**

Thank you for purchasing a quality ATAGO product.

To register your new instrument, please complete the Product Registration & Warranty information at: [www.atago.net/registration/](http://www.atago.net/registration/)

By registering your instrument, we will be able to better serve and support your future needs.  
光 Capture the Light, Measure the Future!

## 1. Names and functions of main parts



**Memo** The eyepiece and daylight plate are user replaceable.  
Please contact an ATAGO distributor to place an order or for any inquiries.

Name	Part #
Eyepiece	RE-2311-12M
Daylight plate	RE-2315-61M



Compact Redesign of the MASTER Series from October 2014.

To all customers using our previous model of the MASTER Series:

The MASTER series has been improved with a clearer, brighter field of view and made even easier to carry. These improvements in our newly compact redesigned models are especially clear when taking measurements in dim lighting, or measuring darkly-colored samples. Even when measuring milky-colored, opaque, or oily samples, the boundary line remains crisp and clear.

Note: The size of the scale has changed. It may take some time to re-adjust to the new field of view when reading measurements.

Try out our new MASTER units and see for yourself!

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

## PRECAUTIONS

(Be sure to read the following before use.)

### Warning!

When using this instrument to measure solutions which may be harmful to humans, please handle all materials carefully, using the proper gloves and mask. Please be aware of any special handling instructions for any harmful solution.

### Caution

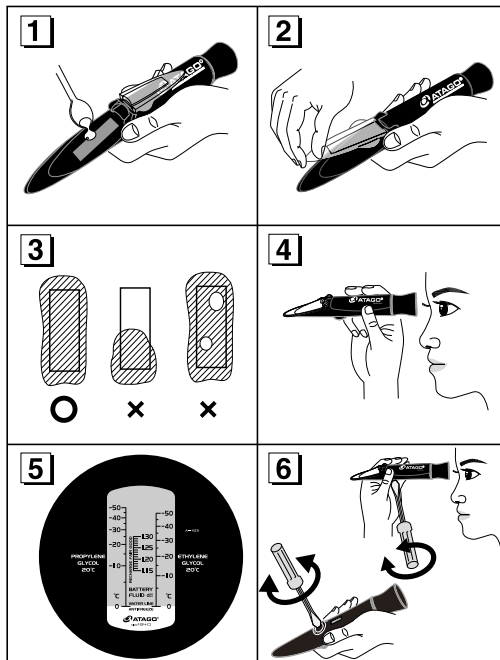
- Carefully read the instruction manual of this instrument to ensure proper use and operating methods.
- When handling and carrying this instrument, avoid dropping or subjecting to any strong shock or excessive force.
- If this instrument is used for any application other than its intended purpose, ATAGO will not be held liable for any damage caused by the use of or the measurement(s) obtained by the operator.
- ATAGO is not liable for any loss and damage caused by the measurement and use of this instrument.
- The prism is considered a consumable item and a charge will be incurred for the replacement of this part.
- All instruments received for repair are subject to a possible inspection fee. ATAGO does not warrant the problems which are caused by user's fault even though the unit is under warranty.

## 2. Calibration

### ⚠ Caution

This refractometer needs to be calibrated before being used for the first time each day. Moreover, if the ambient temperature changes during the day, it needs recalibrated.

- Put one or two drops of tap water (Figure-1).
- Close the daylight plate gently (Figure-2).
- Tap water must spread evenly over the prism surface. Air bubbles should be eliminated (Figure-3).
- View the scale through the eyepiece. To focus, turn the eyepiece in either direction until clear. Use the number printed on the side of the eyepiece as a reference for the position of the eyepiece when it is in focus (Figure-4).
- Confirm that the blue boundary line coincides with "0°C" on the scale (Figure-5).
- If the boundary line does not coincide with "0°C", turn the scale adjustment screw with a flathead screwdriver until it does (Figure-6).

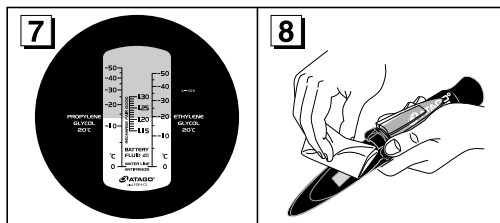


Note: Don't turn the scale adjustment screw excessively, otherwise, it may cause the refractometer to malfunction.

All ATAGO Hand-held refractometers are delivered after adjusted in ATAGO factory.

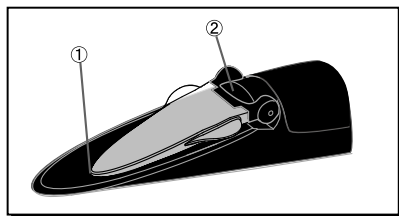
## 3. Measurement

- Put one or two drops of sample on the prism (Figure-1).
- Close the daylight plate gently (Figure-2).
- The sample must spread evenly over the prism surface. Air bubbles should be eliminated (Figure-3).
- View the scale through the eyepiece. To focus, turn the eyepiece in either direction until clear. Use the number printed on the side of the eyepiece as a reference for the position of the eyepiece when it is in focus (Figure-4).
- Read the measurement value where the boundary line intersects the scale (Figure-7).
- Wipe the sample off with a wet tissue (Figure-8).



## 4. Quick and Easy sampling

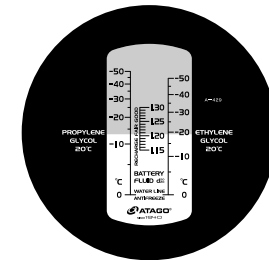
Place approximately 0.3mL of sample on the front end (Figure ①) or the rear end (Figure ②) of the sample stage, and tilt the refractometer slightly in the proper direction to allow the sample to move over the prism. The sample liquid will spread evenly and the measurement value can then be read more quickly and easily. By eliminating the steps of lifting and closing the daylight plate when applying a sample, the operator can save much time when having to measure many samples daily. (This measuring method requires the sample to be low in viscosity.)



## 5. Determination

- When battery fluid is being measured, read the center scale. If boundary line is -

**1.30** In "GOOD" area, the battery is charged enough.  
**1.25** In "FAIR" area, the battery is at normal level of charge; however, be careful not to discharge it further.  
**1.20**  
**1.15** In "RECHARGE" area, charge the battery at once.



- When Ethylene glycol (Freezing temperature) is being measured, read the right scale. Relationship between freezing temperature and Ethylene glycol (pure) concentration is:

Freezing temperature	°C	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	
Concentration of Ethylene glycol	%	0	12	21	28	34	39	44	48	53	57	61	

- When Propylene glycol (Freezing temperature) is being measured, read the left scale. Relationship between freezing temperature and Propylene glycol (pure) concentration is:

Freezing temperature	°C	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	
Concentration of Propylene glycol	%	0	15	24	31	37	41	45	48	50	52	54	

## 6. Exact measurement in extremely hot or cold atmosphere

If ambient temperature is too low or too high, samples do not show their true values which are measured at 20°C. In such case, correct the reading as follows:

Sample Temperature	→	Under 8°C	Over 28°C	Over 35°C
Scales	↓	Subtract from the reading	Add to the reading	
Freezing temperature	°C	1	1	2
Battery fluid specific gravity		0.01	0.01	0.02

## 7. Verifying Calibration and Calibration Certification

### (1) Verifying Calibration

To ensure measurement accuracy, the refractometer should be zero set prior to use each day. Periodic maintenance/service and calibration of your refractometer is recommended. The frequency at which calibration is performed will depend on each company's Standard Operating Procedures.

To Verify Calibration:

- Confirm that the prism is clean and free of scratches.
- Use a tap water. Check that the boundary line is parallel to the memory lines.

### (2) Calibration Certification

Based on ISO quality management system, Calibration Certificates can be ordered for any ATAGO refractometer. HACCP or GMP certification can also be provided at additional cost. Please contact an ATAGO distributor for more information.

## 8. When moisture accumulates in the eyepiece

If the view of the scale and boundary line becomes obstructed by moisture within the eyepiece, follow the instructions below for proper cleaning:

- While holding the eyepiece toward you, turn the eyepiece counter-clockwise until it can be removed.
- Gently wipe the two areas indicated by the arrows in the figure with a clean, dry cloth to remove any moisture.
- Replace the eyepiece and secure by turning in a clockwise direction.

