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.

Part No.	Part Name
RE-110010	Sucrose Solution 10.0%(g/100g)
RE-110020	Sucrose Solution 20.0%(g/100g)
RE-110030	Sucrose Solution 30.0%(g/100g)
RE-110040	Sucrose Solution 40.0%(g/100g)
RE-110050	Sucrose Solution 50.0%(g/100g)

①Confirm that the prism is clean and free of scratches.
②Depending on the model, measure with purified water or a sucrose solution. Check that the boundary line is parallel to the memory lines.
③Verify that the measurement value matches the expected value of the known calibration solution.

[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.

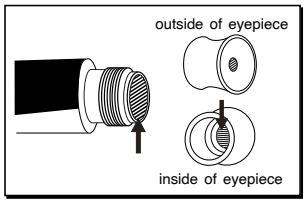
8. Brix scale

All refractometers are designed to measure the refractive index of a solution. The Brix scale is based on a sucrose (sugar) and water solution. However, since most samples contain substances other than sugar - such as salts, minerals and proteins - the Brix percentage represents the total concentration of all soluble solids in the sample. For certain samples, such as cutting oils and other industrial fluids, a conversion chart from the Brix percentage to the sample's total concentration may be necessary.

Note: A brix value expressed as a percentage (%) is equivalent to that value expressed in degrees Brix (° Brix).

9. 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:



①While holding the eyepiece toward you, turn the eyepiece counter-clockwise until it can be removed.
②Gently wipe the two areas indicated by the arrows in the figure with a clean, dry cloth to remove any moisture.
③Replace the eyepiece and secure by turning in a clock-wise direction.

10. Repair and warranty

The MASTER-M series are 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-53M (Cat.No.2353)	MASTER-10M (Cat.No.2373)	MASTER-20M (Cat.No.2383)	MASTER-M (Cat.No.2313)
Measurement range	Brix 0.0 to 53.0%	Brix 0.0 to 10.0%	Brix 0.0 to 20.0%	Brix 0.0 to 33.0%
Minimum scale	Brix 0.2%	Brix 0.1%	Brix 0.1%	Brix 0.2%
Accuracy	Brix ±0.2%(at 20℃)	Brix ±0.2%	Brix ±0.2%	Brix ±0.2%
Repeatability	Brix ±0.1%(at 20℃)	Brix ±0.1%	Brix ±0.1%	Brix ±0.1%
Size and weight	3.2×3.4×16.8cm, 130g	3.2×3.4×20.3cm, 155g	3.2×3.4×20.7cm, 165g	3.2×3.4×20.3cm, 155g

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 pending in U.S.A. and all other countries around the world.

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2353-E04

ATAGO®

MASTER SERIES REFRACTOMETER

MASTER-M series

INSTRUCTION MANUAL

Never splash water on the unit.

MASTER-53M (Cat.No. 2353, Brix 0.0 to 53.0%)
MASTER-10M (Cat.No. 2373, Brix 0.0 to 10.0%)
MASTER-20M (Cat.No. 2383, Brix 0.0 to 20.0%)
MASTER-M (Cat.No. 2313, Brix 0.0 to 33.0%)

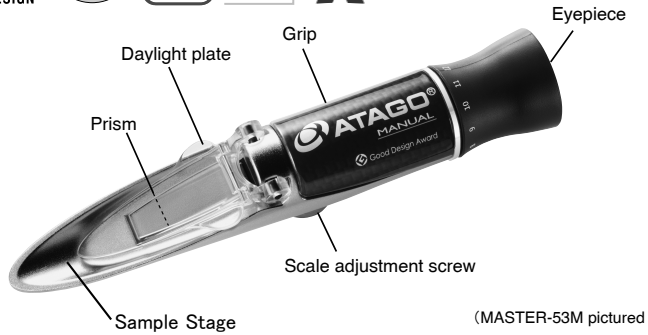
Check Point **To ensure your refractometer continues to operate properly and look new for a long time!**
When measuring samples with a high salt content, be sure to clean the refractometer by wiping the unit completely after each use, especially the metal areas. The unit should be stored in the ATAGO storage box provided when not in use.

Thank you for your purchase of a quality ATAGO product.

光… Capture the Light, Measure the Future!

1. Names and functions of main parts

GOOD DESIGN · Grand Prize of Invention Award 2007 · MEXT 2009 · JPO Commissioner Encouragement Prize 2007 · Patent 特許



(MASTER-53M pictured above.)

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-2315-60M
Small volume daylight plate	RE-2311-67M

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

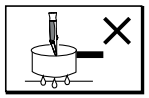
●Carefully read the instruction manual of this instrument to ensure proper use and operating methods.
●When handling and carrying this instrument, avoid dropping or subjecting to any strong shock or excessive force.
●If this instrument is used for any application other than its intended purpose, ATAGO 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 error even though the unit is under warranty.

2. Precautions

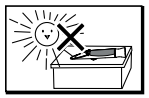
●Never splash water on the unit.

●The refractometer is a precise and sensitive optical instrument. Do not drop or subject to strong shock or excessive force.

●Do not submerge the unit in a hot liquid, such as a soup simmering in a pot.



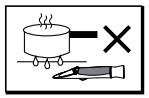
●Store the unit in its original storage case in a dry, room temperature (0-40 ℃) environment away from direct sunlight.



●When measuring a hot sample, the sample should be allowed to cool down to room temperature before being placed on the prism. By following this procedure the integrity of the prism will not deteriorate as quickly if used to measure hot samples continually.

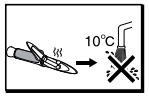
●When measuring a murky or dark solution, the boundry line may be difficult to make out or completely invisible. Hold the unit up to stronger light, such as direct sunlight or a light source for microscopes.

●Keep the unit away from any heat source, such as a cook stove.



●The prism and daylight plate should be completely clean for each measurement. Oil-based solutions may leave a film-like residue. Clean the prism and daylight plate with alcohol or mild detergent diluted with water.

●Use water at ambient temperature (about 20℃) to clean the prism area after measuring a high-temperature solution. Do not use cold water (below 10℃).



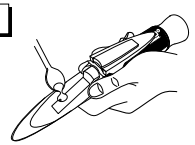
3. Calibration

⚠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.

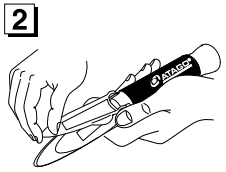
①Put one or two drops of tap water (Figure-1).
②Close the Daylight plate gently (Figure-2).
③Tap water must spread evenly over the prism surface. Air bubbles should be eliminated (Figure-3).
④View the scale through the eyepiece. To focus, turn the eyepiece in either direction until clear. Use the number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

1



※Hold the refractometer between your fingers. Do not wrap your hand around the grip.

2



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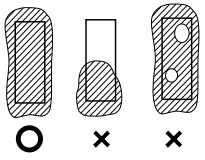

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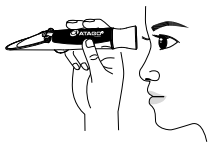

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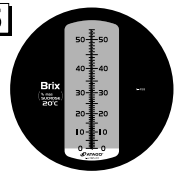
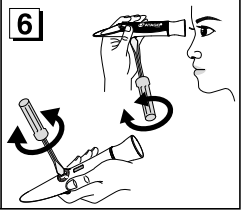


(MASTER-53M pictured above.)

6



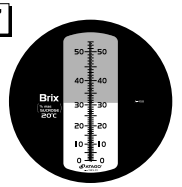
Note : Don't turn the scale adjustment screw excessively, otherwise, it may cause the refractometer to malfunction.

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

4. Measurement

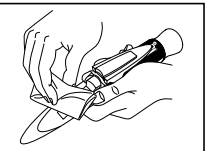
①Put one or two drops of sample on the prism (Figure-1).
②Close the Daylight plate gently (Figure-2).
③The sample must spread evenly over the prism surface. Air bubbles should be eliminated (Figure-3).
④View the scale through the eyepiece. To focus, turn the eyepiece in either direction until clear. 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).
⑤Read the measurement value where the boundary line intersects the scale (Figure-7). ※MASTER-53M scale uses 0.2% increments on the left, and 0.5% increments on the right.
⑥Wipe the sample off with a wet tissue (Figure-8).

7



(MASTER-53M pictured above.)

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 remove any remaining moisture with a dry cloth.

The MASTER-H series is the heat-resistant model of the MASTER series. They are equipped with corrosion-resistant tempered glass prism and designed to withstand high-temperature samples. The conventional H-50, H-80, and H-93 refractometers are recommended for measuring jams during the cooking process.

5. Temperature correction

When the concentration of a liquid is measured by the ATAGO Hand-held Refractometer, the difference in the temperature of the sample will cause a difference in the measured value. The scale of the refractometer is made so that it can indicate the correct value when the refractometer is used for measurements at a temperature of 20℃. The measurement should be corrected. In 3. Calibration and 4. Measurement, temperature correction is made by measuring the Brix value of a sample having the same room temperature after calibrating the refractometer with water which has been left to stand for a period in the room (the water temperature should be the same as the roomtemperature). As this method is convenient, it is generally used. Another method of correcting the temperature is done by using a temperature correction table.

In this case, calibrate the refractometer with tap water having a temperature of 20℃ at the room temperature of 20℃. When calibrating the refractometer, do not move the scale adjustment screw. Then, correct the reading by using the temperature correction table shown on the next page based on the scale reading and measurement temperature.

Example

Scale reading	Measurement temperature	Correction value	Correct value
15.8%	15℃	−0.33	15.5%
27.2%	22℃	+0.15	27.4%

Temperature corrections for refractometric sucrose (dry substance) measurements at 589nm

Reference temperature : 20℃

Temperature ℃	Brix (%)																	
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85
	Subtract from the measured value																	
15	0.29	0.30	0.32	0.33	0.34	0.35	0.36	0.37	0.37	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.37	0.37
16	0.24	0.25	0.26	0.27	0.28	0.28	0.29	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.30	0.30	0.30
17	0.18	0.19	0.20	0.20	0.21	0.21	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.22
18	0.12	0.13	0.13	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07
	Add to the measured value																	
21	0.06	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07
22	0.13	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.15
23	0.20	0.21	0.21	0.22	0.22	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.23	0.23	0.23	0.23	0.22
24	0.27	0.28	0.29	0.29	0.30	0.30	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.31	0.31	0.31	0.30	0.30
25	0.34	0.35	0.36	0.37	0.38	0.38	0.39	0.39	0.40	0.40	0.40	0.40	0.40	0.39	0.39	0.38	0.38	0.37
26	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.47	0.48	0.48	0.48	0.48	0.48	0.47	0.47	0.46	0.46	0.45
27	0.50	0.51	0.52	0.53	0.54	0.55	0.55	0.56	0.56	0.56	0.56	0.56	0.56	0.55	0.55	0.54	0.53	0.52
28	0.58	0.59	0.60	0.61	0.62	0.63	0.64	0.64	0.64	0.65	0.65	0.64	0.64	0.63	0.63	0.62	0.61	0.60
29	0.66	0.67	0.68	0.70	0.71	0.71	0.72	0.73	0.73	0.73	0.73	0.73	0.72	0.72	0.71	0.70	0.69	0.67
30	0.74	0.76	0.77	0.78	0.79	0.80	0.81	0.81	0.82	0.82	0.81	0.81	0.80	0.80	0.79	0.78	0.76	0.75
31	0.83	0.84	0.85	0.87	0.88	0.89	0.89	0.90	0.90	0.90	0.90	0.89	0.89	0.88	0.87	0.86	0.84	0.82
32	0.92	0.93	0.94	0.96	0.97	0.98	0.98	0.99	0.99	0.99	0.99	0.98	0.97	0.96	0.95	0.93	0.92	0.90
33	1.01	1.02	1.03	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.07	1.06	1.04	1.03	1.01	1.00	0.98
34	1.10	1.11	1.13	1.14	1.15	1.16	1.16	1.17	1.17	1.16	1.16	1.15	1.14	1.13	1.11	1.09	1.07	1.05
35	1.19	1.21	1.22	1.23	1.24	1.25	1.25	1.26	1.26	1.25	1.25	1.24	1.23	1.21	1.19	1.17	1.15	1.13
36	1.29	1.30	1.31	1.33	1.34	1.34	1.35	1.35	1.35	1.34	1.34	1.33	1.31	1.29	1.28	1.25	1.23	1.20
37	1.39	1.40	1.41	1.42	1.43	1.44	1.44	1.44	1.44	1.43	1.43	1.41	1.40	1.38	1.36	1.33	1.31	1.28
38	1.49	1.50	1.51	1.52	1.53	1.53	1.54	1.54	1.53	1.53	1.52	1.50	1.48	1.46	1.44	1.42	1.39	1.36
39	1.59	1.60	1.61	1.62	1.63	1.63	1.63	1.63	1.63	1.62	1.61	1.59	1.57	1.55	1.52	1.50	1.47	1.43
40	1.69	1.70	1.71	1.72	1.73	1.73	1.73	1.73	1.72	1.71	1.70	1.68	1.66	1.63	1.61	1.58	1.54	1.51

6. Quick and Easy sampling

Automatic Sample Distribution (ASD) : Place apporoximately 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.)