

Reasons to choose the MASTER

1 Water Resistant



The concept of a washable hand-held analog unit is exceptional. After measuring, the instrument can be cleaned with running water under a faucet. The new structural-design of these units allows them to be washed whenever necessary. Rated IP65 (dust tight and water resistant).

α-H-53S-500



Water Resistant

The world's first feature

5 Durability



The MASTER series has passed all water resistance, dust resistance, and drop tests. Instruments were subjected to water jets from four directions, dropped from a height of one meter onto an oak platform, and withstood the pressure changes of air travel.

6 Calibration



The α and H types can now be calibrated with the new waterproof calibration screw. All MASTER models can be calibrated by end-user.

7 Automatic Sample Distribution (ASD)



ATAGO has developed a spoon-shaped tip that automatically spreads the sample across the prism. This makes the instrument even more user-friendly, saving valuable time.

2 Hygienic Design



The MASTER series was also designed with a smooth and easy-to-clean grip, eliminating the possibility of food and samples being trapped which can result in contamination and bacterial growth.

3 Visibility



Efficiently using an analog unit depends on how easily the measured value can be read. Extensive research and the use of quality optics result in a measurement scale that is very bright, creating a high contrast to see clearly where the boundary intersects the memory lines of the scale.

4 Automatic Temperature Compensation (ATC) α-T-H-53S



The newly designed ATC system allows the MASTER series to read more accurately than any comparable unit. ATAGO has applied for a patent on the design of the improved ATC system. The MASTER series reads more accurately than any comparable unit in the market.

8 Repair and Service



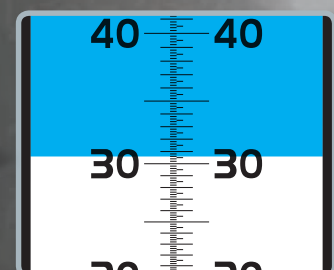
ATAGO has established a close network of customers by providing excellent customer service and support. When an ATAGO instrument needs servicing, not only is each customer treated with respect, but they are also provided with detailed methods and userspecific suggestions on sampling and taking measurements, based on individual needs.

9 Reputation for Quality



ATAGO has built a firm reputation for reliability and quality during its over 70 years history. We are a strong company that exports to over 154 countries with continued growth expectations. ISO 9001 certified, along with our integrated system for producing and marketing our products, based on the "Plan-Do-Check-Act" cycle, is essential to the continued quality and to the promoting of the ATAGO name.

Simple Operation



1 Apply 1-2 drops onto the prism.

2 Close the daylight plate. View the scale through the eyepiece.

3 Read the measurement value where the boundary line intersects the scale.

Applications

-Measuring sugar concentration, concentration, Brix and Refractive Index-

Honey



Honey

Jam, Syrup



Jam, syrup, confectioneries

Soy milk



Soy milk

Condiments



Condiment, seasonings, ketchup, various sauces, soy sauce

Wine



Grapes, wine must

Drink



Fruit juice, soft drink, carbonated beverage

Cooking



Chinese noodle soup, various soup, various sauces

Agriculture



Fruit and vegetable juice, leaf juice, stem juice, root juice

Salinity



Sodium chloride solution, sea water, pickles

Machine Tools



Firefighting foam, soluble cutting oil

Chemicals and medicine



Brine, deicing solution, medicine, chemical, cosmetics, cleaning solution

Clinical



Urine, serum

Optional Accessories



Daylight Plate

For metal body model
Parts.No. RE-2315-60M
For plastic body model
Parts.No. RE-2315-61M

Small Volume Daylight Plate With Hinge Pin

For metal body model
Parts.No. RE-2311-67M
For plastic body model
Parts.No. RE-2391-67M



Super Extractor

Parts.No. RE-29401



Sucrose solution (for Brix confirmation)

Parts.No. RE-110010 10% Sucrose
Parts.No. RE-110020 20% Sucrose
Parts.No. RE-110030 30% Sucrose
Parts.No. RE-110040 40% Sucrose
Parts.No. RE-110050 50% Sucrose
Parts.No. RE-110060 60% Sucrose

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HACCP GMP GLP

ATAGO products comply with HACCP, GMP, and GLP system standards.

All ATAGO products are designed and manufactured in Japan.

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ATAGO
MASTER of REFRACTOMETRY



The Ultimate Hand-Held Refractometer Unsurpassed
in Function, Operation, and Design

MASTER



Design Registration No. 000379326-0001, 000379326-0002 (EU)
ZL 2005 3 0116403.4.S (China), D111526 (Taiwan), D555, 549 (U.S.A.),
1255763, 1255764, 1255765, 1255766, 1255767 (Japan)
Patent Granted in countries around the world.

About the Trade Mark:
Year 2005-ATAGO was established 65 years ago and we have been developing, manufacturing, and marketing Refractometers based on our in-depth study of optics. This year we have released our NEW Hand-Held Refractometer series, the "MASTER" to support and meet our customer's needs. The NEW "MASTER" series is a fitting name to match its ultimate performance. The trade mark "光" is the Japanese Kanji which means "Light". The decision to use this Kanji as a trade mark for the MASTER series is to emphasize that this product was designed and manufactured in Japan. With the multitude of imitation products out in the market today, ATAGO is maintaining our identity as the master of manufacturing quality instruments. We, ATAGO, would like to be your business partner and to be the "light" to continue towards a bright future together.



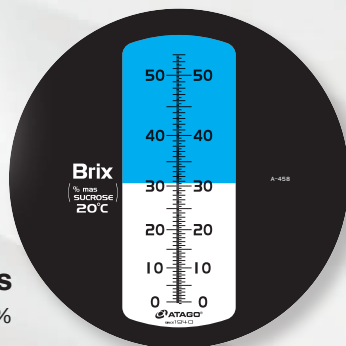
Hand-held Refractometer

MASTER series

Choose the right model for your sample, based on the features and materials of the instrument.



Brix scale examples
MASTER-530X Brix 0 to 53%



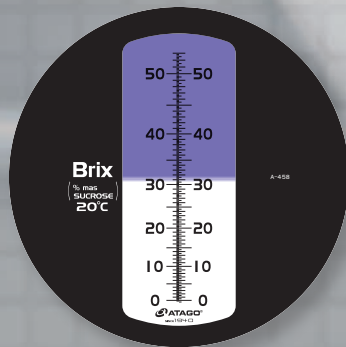
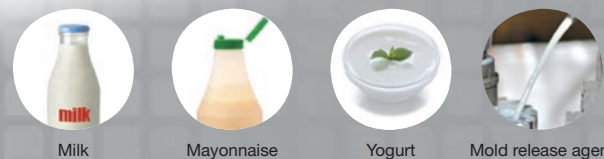
Features 6 types

Both the α and T types are equipped with the Automatic Temperature Compensation feature. Choose the α type for the added feature of IP 65 water-resistance. The H type is the heat-resistant version of the α type.

Series / Model	α	T	M	H	53S	500
Water resistant	●	—	—	●	●	●
Automatic temperature compensation	●	●	—	●	●	—
Heat resistant	—	—	—	●	—	●
Milky sample	—	—	—	—	●	—

MASTER-53S for Milky sample

Opaque, inhomogeneous liquids can be difficult to get a clear boundary line with a conventional refractometer. This model is recommended for cream-based sauces, yogurt, mayonnaise, and various emulsions used in industrial processing.

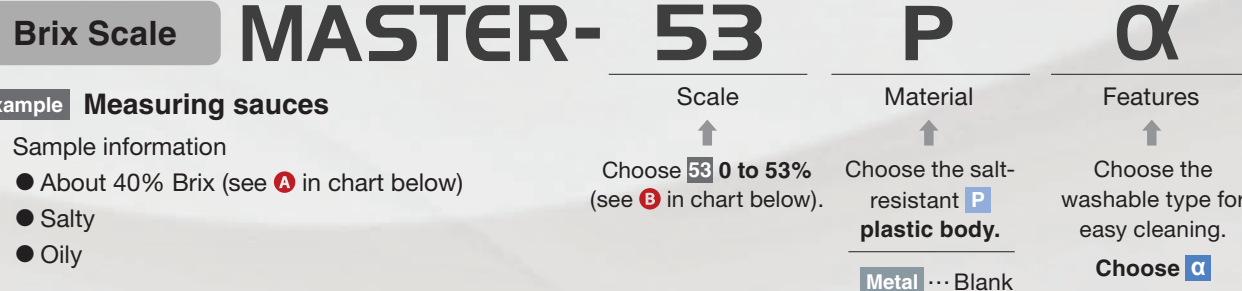


MASTER-500 0 to 90% Wide Brix Range



Understanding model names

A model name consists of the scale (sample name), material, and feature type.



Material 2 types

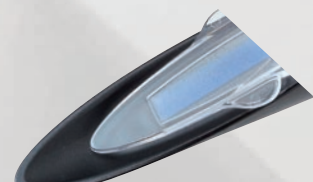
Choose either metal or plastic.



Metal

Die-cast aluminum

Ideal for the agriculture industry, metal working fluids, and various high-temperature samples. Resistant to organic solvents.



Plastic

PBT (polybutylene terephthalate)

Resistant to salty and acidic samples.

Brix of Various Samples

Refractive index and Brix of various types of samples

Brix (%)	Food industry	Chemical industry	Medical Science industry	Memory (Brix)
(RI)				□ = Memory No.
1.333	0 Drinks Green tea	Water Cutting oil (emulsion)	Methanol Saline Aloe extract Sea water	B 20 53 500 0 0 0 20 53 90 %
1.34	5 Beer Tomato Strawberry Lemon	Seasonings Miso soup Nickel plate liquid	Chlorella extract	
1.35	10 Coffee Soy milk Cola Milk	Gelatin liquid Freon113	Serum	
1.36	15 Lactic acid-bacteria beverage	Beef curry Demiglace (sauce) Orange jelly	Acetone Ethanol	
1.37	20 Canned syrup	Silicone solution (emulsion) Electrolyte Freon 11	Acetic acid Saturated saline	
1.38	30 Ketchup	Acrylonitrile		
1.39	40 Soy sauce Sauce A	Jam Low-sugar jam		
1.40	50 Egg yolk	Silicone oil	Octane	
	60 Butter	Ethylene glycol Propylene glycol		
	70 Olive oil	Honey Jam Honey Starch Syrup	Glycerin	
	80	Diesel oil Ricinus		
	90	Polyvinyl chloride (PCV) Styrene Asphalt		

Specifications

Brix Scale

Range (Minimum)	Series	α		T		M	
		Metal	Plastic	Metal	Plastic	Metal	Plastic
53 0 to 53% (0.2%)	Material	MASTER-53α	MASTER-53Pα	MASTER-53T	MASTER-53PT	MASTER-53M	MASTER-53PM
	Cat.No.	2351	2971	2352	2972	2353	2973
	Accuracy	±0.2% (at 20°C) *±0.1% (20°C)		±0.2% (at 20°C) *±0.1% (20°C)		±0.2% (at 20°C) *±0.1%	
	Size & Weight	3.2x3.4x16.8cm, 130g		3.2x3.4x16.8cm, 130g		3.2x3.4x16.8cm, 90g	
20 0 to 20% (0.1%)	Material	MASTER-20α	MASTER-20Pα	MASTER-20T	MASTER-20PT	MASTER-20M	MASTER-20PM
	Cat.No.	2381	2991	2382	2992	2383	2993
	Accuracy	±0.2% *±0.1% (10 to 30°C)		±0.2% *±0.1% (10 to 30°C)		±0.2% *±0.1%	
	Size & Weight	3.2x3.4x20.7cm, 165g		3.2x3.4x20.7cm, 165g		3.2x3.4x20.7cm, 110g	

Heat resistant

Series	H			
Material	Metal			
Material	MASTER-50H	MASTER-80H	MASTER-93H	MASTER-100H
Cat.No.	2354	2364	2374	2384
Range	Brix 0.0 to 50.0%	Brix 30.0 to 80.0%	Brix 45.0 to 93.0%	Brix 60.0 to 100.0%
Minimum	0.5%			
Accuracy	±0.5% (10 to 40°C) *±0.25%			
Size & Weight	3.2x3.4x16.8cm, 130g			

Milky sample

Series	53S
Material	Metal
Model	MASTER-53S
Cat.No.	2355
Range	Brix 0.0 to 53.0%
Minimum	0.2%
Accuracy	±0.2% (at 20°C) *±0.1% (20°C)
Size & Weight	3.2x3.4x16.8cm, 130g

Wide Brix

Series	500
Material	Metal
Model	MASTER-500
Cat.No.	2363
Range	Brix 0.0 to 90.0%
Minimum	1%
Accuracy	±1% *±0.5%
Size & Weight	3.2x3.4x16.8cm, 130g

Vegetable and Fruit

Series	M
Material	Metal
Model	MASTER-AGRI
Cat.No.	2462
Range	Brix 0.0 to 53.0%
Minimum	0.2%
Accuracy	±0.2% (at 20°C) *±0.1% (20°C)
Size & Weight	3.2x3.4x16.8cm, 130g

Special Scale

Sample	Soy Milk	Soy Milk	Honey	Honey / Brix	Brix / Salinity
Series	α	M	α	α	M
Material	Plastic	Plastic	Plastic	Plastic	Plastic
Model	MASTER-Soy Milk α	MASTER-Soy Milk M	MASTER-HONEY	MASTER-HONEY/BX	MASTER-BX/S28M
Cat.No.	2681	2683	2524	2514	2484
Scale	① Soy Milk Concentration (soybean solids) ② Magnesium chloride concentration		Honey moisture	① Honey moisture ② Brix	① Brix ② Sodium chloride
Range	① 0.0 to 20.0% ② 0.0 to 12.0%		12.0 to 30.0%	① 12.0 to 30.0% ② 58.0 to 90.0%	① 0.0 to 33.0% ② 0.0 to 28.0g/100g
Minimum	① 0.2% ② 0.2%		0.2%	① 0.2% ② 0.2%	① 0.5% ② 0.5g/100g
Accuracy	① ±0.5% *±0.25% ② ±0.2% *±0.1% (10 to 30°C)		±0.2% (10 to 40°C) *±0.1%	① ±0.2% *±0.1% ② ±0.2% (10 to 40°C) *±0.1%	—
Size & Weight	3.2x3.4x16.8cm, 90g		3.2x3.4x16.8cm, 90g	3.2x3.4x16.8cm, 90g	3.2x3.4x16.8cm, 90g

Sample	Seawater	Seawater	Salinity	Salinity	Salinity (Wide range)	Salinity (Wide range)
Series	α	M	α	M	α	M
Material	Plastic	Plastic	Plastic	Plastic	Plastic	Plastic
Model	MASTER-S/Mill α	MASTER-S/Mill M	MASTER-S10α	MASTER-S10M	MASTER-S28α	MASTER-S28M
Cat.No.	2491	2493	2471	2473	2481	2483
Scale	① Salinity ② Specific gravity		Sodium chloride		Sodium chloride	
Range	① 0 to 100% ② 1.000 to 1.070		0.0 to 10.0g/100g		0.0 to 28.0g/100g	
Minimum	① 1% ② 0.001		0.1g/100g		0.2g/100g	
Accuracy	① ±2% *±1% ② ±0.001 *±0.0005(10 to 30°C)		±0.2g/100g *±0.1g/100g (10 to 30°C)		±0.2g/100g *±0.1g/100g (10 to 30°C)	
Size & Weight	3.2x3.4x20.7cm, 110g		3.2x3.4x20.3cm, 105g		3.2x3.4x16.8cm, 90g	

Sample	Coolant	Battery Coolant	Battery Coolant	Refractive index
Series	M	M	M	M
Material	Plastic	Plastic	Plastic	Metal
Model	MASTER-BR	MASTER-BC	MASTER-BCF	MASTER-RI
Cat.No.	2930	2931	2932	2612
Scale	① propylene glycol ② ethylene glycol	① ethylene glycol freezing temp ② propylene glycol freezing temp ③ battery fluid d20/20	① ethylene glycol freezing temp ② propylene glycol freezing temp ③ battery fluid d20/20	Refractive index
Range	① 0 to 70% 0 to -50°C ② 0 to 70% 0 to -50°C	① 0 to -50°C ② 0 to -50°C ③ 1.150 to 1.300	① 32 to -60°F ② 32 to -50°F ③ 1.150 to 1.300	1.435 to 1.520
Minimum	5% 5°C	① 5°C ② 5°C ③ 0.01	① 10°F ② 10°F ③ 0.01	0.001
Size & Weight	3.2x3.4x16.8cm, 90g			

Water Resistant | α•H•53S•500: IP65 = dust-tight and protected against water jets (except eye piece)

*Repeatability

STANDARD ACCESSORIES

DR-A1

Test piece	1 pc
Contact liquid [monobromonaphthalene] (4mL)	1 pc
Allen wrench for detaching/attaching prism	1 pc
Lighting adapter for solid sample	1 pc
Tube band	10 pcs
AC adapter (AD-13)	1 pc
AC cable	1 pc
Instruction manual	1 pc

DR-A1-Plus

Test piece	1 pc
Contact liquid [monobromonaphthalene] (4mL)	1 pc
Allen wrench for detaching/attaching prism	1 pc
Lighting adapter for solid sample	1 pc
Tube band	10 pcs
AC adapter (AD-13)	1 pc
AC cable	1 pc
Instruction manual	1 pc

NAR-1T LIQUID

Digital thermometer	1 pc
AC power cable	1 pc
Lamp cable	1 pc
LED lamp	3 pcs
Special screwdriver for calibration	1 pc
Tube band	10 pcs
Instruction manual	1 pc

NAR-1T SOLID

Digital thermometer	1 pc
AC power cable	1 pc
Lamp cable	1 pc
LED lamp	3 pcs
Test piece	1 pc
Contact liquid [monobromonaphthalene] (4mL)	1 pc
Special screwdriver calibration	1 pc
Milky white reflector	1 pc
Tube band	10 pcs
Instruction manual	1 pc

NAR-2T

Digital thermometer	1 pc
AC power cable	1 pc
Lamp cable	1 pc
LED lamp	3 pcs
Test piece	1 pc
Contact liquid [monobromonaphthalene] (4mL)	1 pc
Special screwdriver calibration	1 pc
Tube band	10 pcs
Instruction manual	1 pc

NAR-3T

Digital thermometer	1 pc
AC power cable	1 pc
Lamp cable	1 pc
LED lamp	3 pcs
Allen wrench for calibration	1 pc
Test piece	1 pc
Contact liquid [monobromonaphthalene] (4mL)	1 pc
Air purger for dehumidification	1 pc
Tube band	10 pcs
Instruction manual	1 pc

NAR-4T

Digital thermometer	1 pc
AC power cable	1 pc
Lamp cable	1 pc
LED lamp	3 pcs
Test piece	1 pc
Contact liquid [monobromonaphthalene] (4mL)	1 pc
Contact liquid [methylene iodide containing sulfur solution] (4mL)	1 pc
Special screwdriver calibration	1 pc
Milky white reflector	1 pc
Tube band	10 pcs
Instruction manual	1 pc

DR-M2 DR-M4

Test piece	1 pc
Allen wrench	1 pc
Contact liquid [monobromonaphthalene] (4mL)	1 pc
Contact liquid [methylene iodide containing sulfur solution] (4mL) *	1 pc
Interference filter, 589nm	1 pc
Lighting glass for film measurement	1 pc
Spare bulb	1 pc
Tube band	10 pcs
Instruction manual	1 pc

DR-M2/1550 DR-M4/1550

Near infrared ray viewer	1 pc
Mounting adapter	1 pc
Monochromatic light source device	1 set
Test piece	1 pc
Allen wrench	1 pc
Contact liquid [monobromonaphthalene] (4mL)	1 pc
Contact liquid [methylene iodide containing sulfur solution] (4mL) *	1 pc
Interference filter, 589nm	1 pc
Interference filter frame for 589nm	1 pc
Tube band	10 pcs
Lighting glass for film measurement	1 pc
Instruction manual	1 pc

OPTIONAL PARTS

● For measuring solid samples (excluding the NAR-1T LIQUID)

○ Eyepiece For Polarizing	Parts No. RE-1146
○ Test Piece	
● Test Piece D For Measurement of Film (nD 1.74)	Parts No. RE-1498
● Test Piece E For Measurement of Film (nD 1.92)	Parts No. RE-1499
● Adapter For Film Sample (for DR-A1)	Parts No. RE-1581
○ Contact Liquid	
● Contact Liquid - monobromonaphthalene nD 1.65 (4mL)	Parts No. RE-1196
● Contact Liquid nD 1.78 (4mL)	Parts No. RE-1199
● Contact Liquid LJ nD 1.80 (7mL)	Parts No. RE-9908
○ Test Piece with monobromonaphthalene as contact liquid	
● Test Piece A (nD=1.516) with M-Naphthalene with monobromonaphthalene as contact liquid	Parts No. RE-1195
● Test Piece C (nD=1.620) with M-Naphthalene with monobromonaphthalene as contact liquid	Parts No. RE-1197

● For connecting to a computer (for DR-A1/DR-A1-Plus only)

○ RS-232C Cable For Personal Computer (D-Sub 9 Pin)	Parts No. RE-15305
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● Interference Filters for MULTI-WAVELENGTH ABBE REFRACTOMETERS

(Standard accessory only 589nm)

○ for DR-M2/DR-M4

589(D)nm	Parts No. RE-3520	546(e)nm	Parts No. RE-3523
486(F)nm	Parts No. RE-3521	480(F')nm	Parts No. RE-3524
656(C)nm	Parts No. RE-3522	644(C')nm	Parts No. RE-3525
Any wavelength (450 to 539nm, 540 to 680nm, 681 to 799nm, 800 to 1100nm)	Parts No. RE-3526		

○ for DR-M2/1550, DR-M4/1550

589(D)nm	Parts No. RE-16501	546(e)nm	Parts No. RE-16504
486(F)nm	Parts No. RE-16502	480(F')nm	Parts No. RE-16505
656(C)nm	Parts No. RE-16503	644(C')nm	Parts No. RE-16506
Any wavelength (450 to 539nm, 540 to 680nm, 681 to 799nm, 800 to 1550nm)	Parts No. RE-16507		

● Near-infrared Ray Viewer for MULTI-WAVELENGTH ABBE REFRACTOMETERS

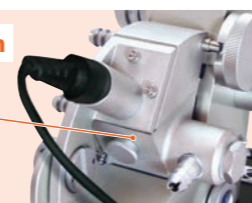
○ Near-infrared Ray Viewer (With Adapter)	Parts No. RE-9119
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Measurement of Birefringent Samples

Measurement of birefringent (double refraction) materials requires an optional Polarizing Eyepiece (Part No. RE-1146). Double refraction measurements are available at wavelengths between 450 and 680nm. Contact us for more details.

Special Order Option

The sample stage height can be customized.



All ATAGO refractometers are designed and manufactured in Japan.

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HACCP GMP GLP

ATAGO products comply with HACCP, GMP, and GLP system standards.

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ABBE REFRACTOMETERS



Abbe Refractometers

- ▶ Page 2 **DR-A1 <DIGITAL>**
- DR-A1-Plus <DIGITAL>**
- ▶ Page 3 **NAR-1T LIQUID**
- NAR-1T SOLID**
- NAR-2T <HIGH TEMPERATURE MODEL>**
- ▶ Page 4 **NAR-3T <PRECISION MODEL>**
- NAR-4T <HIGH REFRACTIVE INDEX MODEL>**

Multi-Wavelength Abbe Refractometers

- ▶ Page 5 **DR-M2**
- DR-M4**
- ▶ Page 6 **DR-M2/1550**
- DR-M4/1550**



ATAGO®

■ Uses and Applications of the Abbe Refractometers

ATAGO's Abbe Refractometers are widely used in a variety of fields; from basic research to product management.

Uses and Applications

For measuring the refractive index (nD) of liquid samples between 5 to 50°C:	DR-A1, DR-A1-Plus, and NAR-1T LIQUID. We recommend the NAR-3T for high-accuracy measurements.
For measuring the refractive index (nD) of liquid samples up to 120°C:	NAR-2T
For measuring the refractive index (nD) of solid samples (glass, plastics, films, etc.):	NAR-1T SOLID, DR-A1, and DR-A1-Plus. The NAR-3T is also capable of measuring clear, translucent glass or plastics.
For measuring liquid or solid samples with a high refractive index (1.47 to 1.87):	NAR-4T
For measuring and determining the refractive index or Abbe number of liquid or solid samples at different wavelengths:	DR-M Series: DR-M2, DR-M2/1550, DR-M4, and DR-M4/1550 (For high refractive index measurements.)
For determining average dispersion values or abbe numbers:	NAR-1T SOLID, NAR-2T, and NAR-3T
For measuring Brix (%):	DR-A1, DR-A1-Plus, and NAR-1T LIQUID. We recommend the NAR-3T for high-accuracy measurements.
For connecting to a printer:	DR-A1, DR-A1-Plus, and DR-M Series
For measuring birefringent (double refraction) samples (plastics, films) that have different refractive indices depending on their orientation, or for measuring the ordinary ray (n subscript null) or extraordinary ray (n subscript exponential) of liquid crystals (LCs):	DR-A1, DR-A1-Plus, NAR-1T SOLID, NAR-2T, NAR-4T, and DR-M Series

■ ATAGO Products Conform to ASTM Standards

Please contact ATAGO for further details.

- D542 STM for Index of Refraction of Transparent Organic Plastics
- D1045 STM for Sampling and Testing Plasticizers Used in Plastics
- D1218 STM for Refractive Index and Refractive Dispersion of Hydrocarbon Liquids
- D1416 STM for Rubber from Synthetic Sources--Chemical Analysis
- D1747 STM for Refractive Index of Viscous Materials
- D3321 STM for Use of the Refractometer for Field Test Determination of the Freezing Point of Aqueous Engine Coolants
- D4095 STM for Use of the Refractometer for Determining Nonvolatile Matter (Total Solids) in Floor Polishes
- D5006 STM for Measurement of Fuel System Icing Inhibitors (Ether Type) in Aviation Fuels
- D5775 STM for Rubber from Synthetic Sources-Bound Styrene in SBR

■ Sucrose Solution (for Brix confirmation)

Sucrose solutions for Brix confirmation are now available by ATAGO. Please choose the most suitable sucrose solution for your application.



Part No.	Part Name	Brix Concentration	Contents
RE-110010	10% Sucrose	10.00 ±0.03%	Approx. 5mL
RE-110020	20% Sucrose	20.00 ±0.03%	Approx. 5mL
RE-110030	30% Sucrose	30.00 ±0.03%	Approx. 5mL
RE-110040	40% Sucrose	40.00 ±0.04%	Approx. 5mL
RE-110050	50% Sucrose	50.00 ±0.05%	Approx. 5mL
RE-110060	60% Sucrose	60.00 ±0.05%	Approx. 5mL

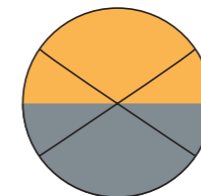
* Warranty period for these solutions is 6 weeks.

Custom concentration sucrose solutions are now available. Accuracy and price will depend on the concentration; please contact ATAGO for more details.

DIGITAL ABBE REFRACTOMETERS

DR-A1

Cat.No.1310



Refraction view



Display

By simply aligning the boundary line of refraction at the cross hairs, this refractometer directly indicates a measurement value (in refractive index or Brix (%), selectable) together with the temperature on a digital display. This refractometer enables anyone to easily carry out measurements without reading analog graduation.

*Dispersion value cannot be measured with the DR-A1.

Choosing the Right Model for Your Sample Type

DR-A1

Stews
Ketchup
Curry
Salsa
Vinaigrettes
Opaque samples with undissolved solids

DR-A1-Plus

Milk
Yogurt
Puree
Grape juice
Soy sauce
Clear samples
Opaque samples with no undissolved solids

DR-A1-Plus

for Opaque Samples

Cat.No.1311

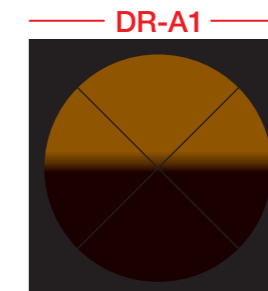


With the new prism, the field of view is brighter than the predecessor model (DR-A1), making it easier to measure inhomogeneous/opaque samples.

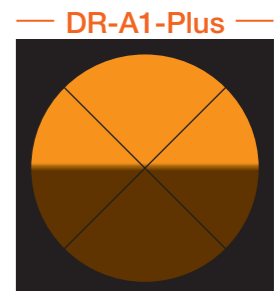
Common Specifications (DR-A1/DR-A1-Plus)

Measurement Range	Refractive Index (nD) 1.3000 to 1.7100, Brix 0.0 to 100.0% (ATC is executed at 5 to 50°C)
Resolution	Refractive Index (nD) 0.0001, Brix 0.1%
Measurement accuracy	Refractive Index (nD) ±0.0002, Brix ±0.1%
Measurement temperature	5 to 50°C (Circulating constant temperature bath range, as well as Brix temperature compensation range.)
Thermometer accuracy	±0.2°C
Ambient temperature	5 to 40°C
Indications	Refractive Index (nD), Brix (%), Temp (°C)
Display	LCD
Light source	LED Lamp (Approximating to wavelength of D-line)
Power supply	AC adapter (100 to 240V (50/60Hz) AC input)
Power consumption	16VA
Output	Printer DP-63(C) (Optional) PC (via RS-232C)
Dimensions and weight	13x29x31cm, 6.0kg (Main unit) 10.5x17.5x4cm, 0.7kg (AC adapter)

For Measuring Emulsions or Dark Samples



The DR-A1 has a slightly dimmer field of view, which makes it difficult to measure emulsions or dark samples.



The DR-A1-Plus features a brighter field of view, making it easier to measure dark, opaque samples.

*Samples containing undissolved solids may not produce measurement results.

NAR-1T LIQUID

For Measuring Liquid Samples Only Cat.No.1211

NAR-1T SOLID

For Measuring Solid Samples Cat.No.1212



The NAR-1T LIQUID is for liquid sample measurement only. This model has the Refractive Index scale and Brix scale, and operates with D line (589nm) light source. Calibration is performed using distilled water.

The NAR-1T SOLID Abbe Refractometer was designed for solid sample measurement (this model can also measure liquid samples). This model has the Refractive Index scale and Brix scale, and operates with D line (589nm) light source.

Specifications

Measurement Range	Refractive Index (nD) 1.3000 to 1.7000, Brix 0.0 to 95.0%
Minimum scale	Refractive Index (nD) 0.001, Brix 0.5%
Measurement accuracy	Refractive Index (nD) ±0.0002, Brix ±0.1%
Average dispersion value	nF-nC (to be calculated according to conversion table)*SOLID only
Measurement temperature	5 to 50°C (Temperature range regulated by circulating constant temperature water bath.)
Thermometer accuracy	±0.2°C
Ambient temperature	5 to 40°C
Light source	LED Lamp (Approximating to wavelength of D-line)
Power supply	AC100 to 240V, 50/60Hz
Power consumption	5VA
Dimensions and weight	13×18×23cm, 2.5kg (Main unit) 10×11×7cm, 0.5kg (Thermometer)

NAR-2T

High Temperature Model Cat.No.1220



Designed for use with compounds that require measurement at high temperatures (up to 120°C). Capable of measuring samples from 5 to 120°C, such as substances with a melting point higher than room temperature, or compounds containing substances with a transition temperature below 120°C. Aside from liquid samples, glass, films, plastics and other solid samples can also be measured.

*Optional accessories: Circulating constant temperature bath (up to 60°C). (Pg. 5) For a circulating constant temperature bath above 61°C, please purchase separately (not available through ATAGO).

Specifications

Measurement Range	Refractive Index (nD) 1.3000 to 1.7000, Brix 0.0 to 95.0%
Minimum scale	Refractive Index (nD) 0.001, Brix 0.5%
Measurement accuracy	Refractive Index (nD) ±0.0002, Brix ±0.1%
Average dispersion value	nF-nC (to be calculated according to conversion table)
Measurement temperature	5 to 120°C (Temperature range regulated by circulating constant temperature water bath.)
Thermometer accuracy	0 to 100°C...±0.2°C, 100 to 120°C...±0.5°C
Ambient temperature	5 to 40°C
Light source	LED Lamp (Approximating to wavelength of D-line)
Power supply	AC100 to 240V, 50/60Hz
Power consumption	5VA
Dimensions and weight	12×20×25cm, 5.8kg (Main unit) 10×11×7cm, 0.5kg (Thermometer)

NAR-3T

Precision Model Cat.No.1230



The NAR-3T is the unit with the highest degree of precision and accuracy among the Abbe Refractometers. It was developed to give improved measurement accuracy and ease of use. This was achieved by making fundamental improvements to the optical system and utilizing a larger scale, which allows for a refractive index scale measurements of up to 0.00005. Incorporating a high intensity lamp and using a double control knob gives quick and more accurate control.

Specifications

Measurement Range	Refractive Index (nD) 1.30000 to 1.71000, Brix 0.00 to 95.00%
Minimum scale	Refractive Index (nD) 0.0002, Brix 0.1%
Measurement accuracy	Refractive Index (nD) ±0.0001, Brix ±0.05%
Average dispersion value	nF-nC (to be calculated according to conversion table)
Measurement temperature	5 to 50°C (Temperature range regulated by circulating constant temperature water bath.)
Thermometer accuracy	±0.2°C
Ambient temperature	5 to 40°C
Light source	LED Lamp (Approximating to wavelength of D-line)
Power supply	AC100 to 240V, 50/60Hz
Power consumption	5VA
Dimensions and weight	12×31×34cm, 9.0kg (Main unit) 10×11×7cm, 0.5kg (Thermometer)

NAR-4T

High Refractive Index Model Cat.No.1240



Research and Development on new materials for modern technologies is being actively conducted in every industry. Many of these materials (especially polymer film and related materials) are of high refractive index - often too high for the existing Abbe refractometers. These can now be measured with the nD 1.4700 to 1.8700 range of the NAR-4T.

*Dispersion values cannot be measured with this unit.

Specifications

Measurement Range	Refractive Index (nD) 1.4700 to 1.8700
Minimum scale	Refractive Index (nD) 0.001
Measurement accuracy	Refractive Index (nD) ±0.0002
Measurement temperature	5 to 50°C (Temperature range regulated by circulating constant temperature water bath.)
Thermometer accuracy	±0.2°C
Ambient temperature	5 to 40°C
Light source	LED Lamp (Approximating to wavelength of D-line)
Power supply	AC100 to 240V, 50/60Hz
Power consumption	5VA
Dimensions and weight	13×18×23cm, 2.5kg (Main unit) 10×11×7cm, 0.5kg (Thermometer)

Custom Refractive Index Ranges Available by Special Order

- NAR-1T • LO Cat.No.1217 Measurement Range: Refractive Index (nD) 1.1500 to 1.4800, Measurement temperature: 5 to 50°C
- NAR-2T • LO Cat.No.1227 Measurement Range: Refractive Index (nD) 1.1500 to 1.4800, Measurement temperature: 5 to 120°C

Note: To obtain the refractive index value, simply refer to the conversion table that is provided with this unit. Dispersion values cannot be measured with this unit.

- NAR-2T • HI Cat.No.1228 Measurement Range: Refractive Index (nD) 1.4700 to 1.8700, Measurement temperature: 5 to 120°C
- NAR-2T • UH Cat.No.1229 Measurement Range: Refractive Index (nD) 1.7000 to 2.0800, Measurement temperature: 5 to 120°C

DR-M2

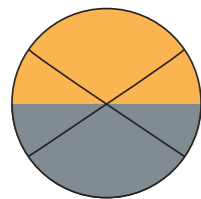
Cat.No.1410

DR-M4

High Refractive Index Model

Cat.No.1414

Customizable wavelength: 1100nm range supported



Refraction view



Display



Refractive Index or Abbe number (vd or ve) can be measured at different wavelengths ranging from 450 to 1,100nm. For measurement at wavelengths ranging from 681 to 1,100nm, the optional near infrared ray viewer (Part No.RE-9119) is required. The DR-M2/DR-M4 digitally displays the measurement results of refractive index or Abbe number on the LCD. Measurement can be achieved by

matching the boundary line at the intersection point of the cross hairs. These refractometers can be connected to the digital printer. The DR-M4 is a high refractive index version of the DR-M2, with a refractive index measurement range of 1.4700 to 1.8700 (at a wavelength of 589nm). The DR-M4 shares common appearance and features with the DR-M2.

Specifications

Measurement Range	Resolution	Refractive Index (nD) 0.0001, Abbe number 0.1
DR-M2	Measurement accuracy	Refractive Index (nD) ±0.0002 (With the attached test piece at 500 to 650nm)
Wavelength 450nm : Refractive Index 1.3278 to 1.7379	Wavelength range	From 450 to 1,100nm
Wavelength 589nm : Refractive Index 1.3000 to 1.7100	Measurement temperature range	5 to 50°C (Temperature range regulated by circulating constant temperature water bath.)
Wavelength 680nm : Refractive Index 1.2912 to 1.7011	Thermometer accuracy	±0.2°C
Wavelength 1,100nm : Refractive Index 1.2743 to 1.6840	Ambient temperature	5 to 40°C
DR-M4	Power consumption	160VA
Wavelength 450nm : Refractive Index 1.5219 to 1.9220	Output	For digital printer, DP-63(B) (optional), Conforming to Centronics standard
Wavelength 589nm : Refractive Index 1.4700 to 1.8700	Power supply	AC100 to 240V, 50/60Hz
Wavelength 680nm : Refractive Index 1.4545 to 1.8544	Dimensions and weight	13×29×31cm, 6.0kg (Main unit)
Wavelength 1,100nm : Refractive Index 1.4260 to 1.8259		15×33×11cm, 3.2kg (Power supply unit)

Optional Accessories

Circulating Constant Temperature Bath

60-C5

Cat.No.1923

A circulating water bath for precise temperature control of refractometers without Peltier. The temperature range can be set from 10 to 60°C and its compact, easy to use design makes it optimal for connecting to a refractometer.



Specifications

Tank capacity	1.0 L
Temperature setting range	10 to 60°C (water)
Minimum temperature indication	0.1°C
Constant-temperature accuracy	±0.2°C
Power consumption	250VA
Power supply	AC 100 to 240V, 50/60Hz
Dimensions and weight	20.4×33.6×28.9cm, 9.0kg (main unit only)

Digital Printer

DP-63(C)

for DR-A1 · DR-A1-Plus

Cat.No.3136

DP-63(B)

for DR-M2 · DR-M4 · DR-M2/1550 · DR-M4/1550

Cat.No.3135



Specifications

Printing method	Thermal dot
Power consumption	13VA
Power supply	AC adapter (Input voltage: AC100 to 240V)
Dimensions and weight	17×16×7cm 580g (main unit only)

DR-M2/1550

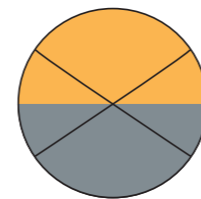
Cat.No.1412

DR-M4/1550

High Refractive Index Model

Cat.No.1415

Customizable wavelength: 1550nm range supported



Refraction view



Display



Refractive Index or Abbe number (vd or ve) can be measured at different wavelengths ranging from 450 to 1,550nm. Measurement at wavelengths of 1550nm has become more in demand with the recent development of materials for the IT communications field. The DR-M2/1550 and the DR-M4/1550 are suitable for measuring samples that require a refractive index in the near infrared range, such as fiber optics materials, optical glass, and plastics. These models are equipped with a power supply unit and a monochromatic light

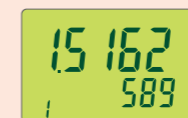
source. They can be used with a near infrared ray viewer or interference filters. These refractometers digitally display the measurement result on the LCD. Measurement can be achieved by matching the boundary line at the intersection point of the cross hairs. These units can be connected to the digital printer. The DR-M4/1550 is a high refractive index version of the DR-M2/1550, with a refractive index measurement range of 1.4700 to 1.8700 (at a wavelength of 589nm). The DR-M4/1550 shares common appearance and features with the DR-M2/1550.

Specifications

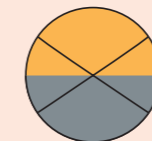
Measurement Range	Resolution	Refractive Index (nD) 0.0001, Abbe number 0.1
DR-M2/1550	Measurement accuracy	Refractive Index (nD) ±0.0002 (with the attached test piece at 500 to 650nm)
Wavelength 450nm : Refractive Index 1.3278 to 1.7379	Wavelength range	From 450 to 1,550nm
Wavelength 589nm : Refractive Index 1.3000 to 1.7100	Measurement temperature range	5 to 50°C (Temperature range regulated by circulating constant temperature water bath.)
Wavelength 680nm : Refractive Index 1.2912 to 1.7011	Thermometer accuracy	±0.2°C
Wavelength 1,100nm : Refractive Index 1.2743 to 1.6840	Ambient temperature	5 to 40°C
Wavelength 1,550nm : Refractive Index 1.2662 to 1.6759	Power consumption	160VA (Refractometer), 240VA (Monochromatic Light source)
DR-M4/1550	Output	For digital printer, DP-63(B) (optional), Conforming to Centronics standard
Wavelength 450nm : Refractive Index 1.5167 to 1.9166	Power supply	AC100 to 240V, 50/60Hz
Wavelength 589nm : Refractive Index 1.4700 to 1.8700	Dimensions and weight	13×29×31cm, 6.0kg (Main unit)
Wavelength 680nm : Refractive Index 1.4559 to 1.8557		15×33×11cm, 3.2kg (Power supply unit)
Wavelength 1,100nm : Refractive Index 1.4298 to 1.8296		22×30×20 to 30cm, 5.2kg (Light source)
Wavelength 1,550nm : Refractive Index 1.4211 to 1.8209		

Abbe number can be measured simply! (In the case of measurement of Abbe number "vd")

- Set the sample on the prism surface.
- Insert the 589nm interference filter (attached to the DR-M2 as a standard accessory). While looking through the eyepiece, match the boundary line with the intersection point of the cross hairs. Then, press the SET key.

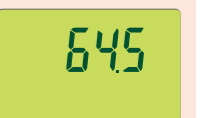
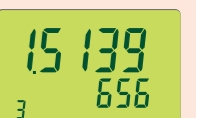


Display



Refraction view

- Replace the interference filter with the 486nm interference filter (an optional part). While looking through the eyepiece, match the boundary line with the intersection point of the cross hairs. Then, press the SET key.
- Replace the interference filter with the 656nm interference filter (of an optional part). While looking through the eyepiece, match the boundary line with the intersection point of the cross hairs.
- Press the SET key. The indication on the display at that time represents the Abbe number "vd".



* For optimum convenience, use an optional digital printer to print out the refractive index at each wavelength and Abbe number.

DD-7

The Ultimate Answer For Monitoring Low-Concentration Liquids

High-accuracy measurement is made possible by measuring the difference in concentrations of 2 solutions.

Application examples:

- ◆ Tea
- ◆ Unsweetened or diet beverages
- ◆ Coffee or herbal extracts
- ◆ Cleaning and sanitizing solutions
- ◆ Surfactants



The DD-7 measures solutions of up to 2% Brix concentration at the extremely high-accuracy level of $\pm 0.005\%$ Brix.

(Note that the range of measurement gets narrower at concentrations higher than 10% Brix.) When a reference solution of 8.000% Brix is used, for example, the DD-7 can measure concentrations in the range of 8% to 10% Brix at resolution of 0.001% Brix and precision of measurement of $\pm 0.005\%$ Brix. Note: High viscosity samples may not be suitable for measurement.

- Measurement is very simple. Inject a reference solution and a sample solution to respective injection ports, and press the Start Switch.
- Digital readings eliminate reading errors resulting from user subjectivity.
- Measurement data can be exported to a printer or computer via RS-232C connection.



Measure low-concentration food and beverages, such as coffee, tea, diet sodas, and herbal extracts.



Measure concentrations of sanitizers and disinfectants, such as hydrogen peroxide solutions, at a precision level of $\pm 0.012\%$ or higher.



Measure surfactants, anti-rust agents, metal-working fluids, and other industrial solutions at $\pm 0.005\%$ Brix accuracy.

Liquid Crystal Display (LCD)

Operation Panel

Reference Port

Sample Port

Specifications

- Method of measurement : Differential optical refraction method
- Measurement range : 0.000 to 2.000% in concentration (for sucrose solution)
It is possible to measure samples with refractive index up to 1.50 (nD) by reference solution. (Samples must be low in viscosity.)
- Measurement accuracy : $\pm 0.005\%$ (In the case of measurement of sucrose solution (0 to 2%) at 30°C)
- Unit of minimum display : 0.001%
- Temperature control range : Between 5°C and 10°C above ambient temperature; up to 40°C
*Heating only (no cooling)
- Ambient temperature : 10 to 30°C
- Display area : Two 24-character lines (LCD)
- Light source : LED
- Light sensor : Photo-diode (dual type)
- Output RS-232C Printer : Digital printer DP-63, DP-AD(optional)
- Power supply : AC100 to 240V, 50/60Hz
- Power consumption : 50VA
- Dimensions : 36(W) x 35(D) x 14(H)cm
- Weight : 5.8kg

All ATAGO products are designed and manufactured in Japan.

HACCP GMP GLP ATAGO products comply with HACCP, GMP, and GLP system standards.

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* Specifications and appearance are subject to change without notice.