

**ATAGO®**

Hand-held Refractometers

MASTER of REFRACTOMETRY

Pocket PAL series

The PAL is a completely newly designed digital hand-held instrument that will change the traditional conceptions of refractometers.

●Dimensions and weight : 55×31×109mm, 100g

DIGITAL HAND-HELD "POCKET" REFRACTOMETERS



PAL-1 Cat.No. 3810

PAL-2 Cat.No. 3820

PAL-3 Cat.No. 3830

PAL-α Cat.No. 3840

Feature

- Calibration with water only
- Extremely water resistant (IP65)
- Light & Compact, 100g
- Revolutionary new feature ELI*
- Automatic Temperature Compensation (A.T.C.)
- Measurement in 3 seconds
- Ergonomically designed for one-handed operation
- Equipped with a strap holder option
- Convenient storage case

* External Light Interference (ELI) -Patent Pending

Everyone is talking about
the new "Pocket" as featured
on recent TV programs
and Magazines



Always clean and shiny!!

Can be easily rinsed under
running water.



Patent for Design Registration No. ZL200310103015.2 (China)
Patent for Invention Registration No. ZL03303431.1 (China), 089244 (Taiwan)
Patent pending in U.S.A., and Germany and all other countries around the world.

Digital Hand-held "Pocket" Refractometers (Special Scales)

Model	Scale	Model	Scale	Model	Scale	Model	Scale
Brix		Sea water (S.G.)		Chemical product's ingredient			
PAL-1	Brix (0.0~53.0%)	PAL-07S	Sea water (S.G.)	PAL-23S	Glycerin (Low concentration)		
PAL-2	Brix (45.0~93.0%)	PAL-08S	Sea water (Baume)	PAL-24S	Glycerin (High concentration)		
PAL-3	Brix (0.0~93.0%)	Food additives, Ingredients		PAL-30S	Acetic acid		
PAL-α	Brix (0.0~85.0%)	PAL-29S	Citric acid	PAL-31S	Formic acid		
Sugars		PAL-30S	Acetic acid	PAL-32S	Phosphoric acid		
PAL-12S	Dextran	PAL-32S	Phosphoric acid	PAL-44S	Lithium chloride		
PAL-14S	Fructose	PAL-64S	Sodium bicarbonate	PAL-45S	Barium chloride		
PAL-15S	Glucose	PAL-65S	Sodium tartrate	PAL-46S	Cobalt chloride		
PAL-16S	High Fructose Corn Syrup (HFCS-42)	PAL-70S	Potassium phosphate	PAL-47S	Ferric chloride		
PAL-17S	High Fructose Corn Syrup (HFCS-55)	Alcohol liquid		PAL-48S	Strontium chloride		
PAL-18S	Inverted sugar	PAL-34S	Ethyl alcohol	PAL-49S	Potassium chloride		
PAL-19S	Lactose	PAL-36S	Methyl alcohol	PAL-50S	Potassium bromide		
PAL-20S	Maltose	PAL-37S	Isopropyl alcohol	PAL-51S	Sodium bromide		
Honey		PAL-85S	Polyvinyl alcohol	PAL-52S	Potassium iodide		
PAL-22S	Honey moisture	Pharmaceutical reagents, Ingredients		PAL-53S	Copper sulfate (Concentration)		
Soy milk, Bittern (Magnesium chloride)		PAL-12S	Dextran	PAL-54S	Copper sulfate (S.G.)		
PAL-27S	Soy milk	PAL-13S	Creatine	PAL-55S	Magnesium sulfate		
PAL-43S	Bittern (Magnesium chloride)	PAL-23S	Glycerin (Low concentration)	PAL-56S	Potassium sulfate		
Cooking		PAL-24S	Glycerin (High concentration)	PAL-57S	Nickel sulfate		
PAL-96S	Chinese noodle soup / Baume of kansui (Double scale)	PAL-25S	Inulin	PAL-58S	Sodium nitrate		
PAL-98S	Condiment	PAL-26S	Mannitol	PAL-59S	Zinc sulfate		
PAL-Pâtissier	Brix / Baume (Double scale) NEW	PAL-31S	Formic acid	PAL-60S	Silver nitrate		
Salinity		PAL-32S	Phosphoric acid	PAL-61S	Sodium nitrate		
PAL-03S	Sodium chloride (g/100g)	PAL-51S	Sodium bromide	PAL-62S	Potassium carbonate		
PAL-106S	Sodium chloride (g/100ml)	PAL-55S	Magnesium sulfate	PAL-63S	Sodium carbonate		
PAL-04S	Sodium chloride (S.G.)	PAL-64S	Sodium bicarbonate	PAL-64S	Sodium bicarbonate		
PAL-05S	Sodium chloride (Baume)	PAL-65S	Sodium tartrate	PAL-67S	Potassium chromate		
Sea water		PAL-66S	Potassium oxalate	PAL-68S	Potassium dichromate		
PAL-06S	Sea water (Concentration)	PAL-68S	Potassium dichromate	PAL-69S	Sodium thiosulfate		
Wine		PAL-70S	Potassium phosphate	PAL-70S	Potassium phosphate		
PAL-79S	T.A. 1990	PAL-72S	Sodium tungstate	PAL-71S	Sodium molybdate		
Artificial leather, Fabric		Snow-melting agent		PAL-72S	Sodium tungstate		
PAL-38S	Dimethyl formamide	PAL-03S	Snow-melting agent (Sodium chloride)	Coolant (Double scale)			
Paste		PAL-41S	Snow-melting agent (Calcium chloride)	PAL-88S	Propylene glycol / Freezing point of Propylene glycol (°C)		
PAL-21S	Dextrin	PAL-43S	Snow-melting agent (Magnesium chloride)	PAL-89S	Propylene glycol / Freezing point of Propylene glycol (°F)		
Cutting oil		Artificial leather, Fabric		PAL-91S	Ethylene glycol / Freezing point of Ethylene glycol (°C)		
PAL-102S	Cutting oil	PAL-38S	Dimethyl formamide	PAL-92S	Ethylene glycol / Freezing point of Ethylene glycol (°F)		
Refractive index		Cutting oil		Refractive index			
PAL-RI	Refractive index	Paste		Cutting oil			



HAND-HELD REFRACTOMETERS

MASTER series

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

Wide variety of ATAGO's Hand-Held Refractometers. Pick up the best refractometer depending on the type of sample and its environment.

Hand-held refractometers MASTER qseries

NON A.T.C. model	A.T.C. & Water Resistant (IP65) model	A.T.C. model	A.T.C. & Water Resistant (IP65) (Heat Resistant model)
MASTER-M MASTER-2M MASTER-3M MASTER-4M MASTER-53M MASTER-RI (nD)	MASTER- α MASTER-2 α MASTER-3 α MASTER-4 α MASTER-53 α	MASTER-T MASTER-2T MASTER-3T MASTER-4T MASTER-53T	MASTER-50H MASTER-80H MASTER-93H MASTER-100H

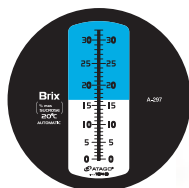
MASTER SERIES REFRACTOMETER (WATER RESISTANT & A.T.C.)

NEW

MASTER- α Cat.No. 2311

This new type of Hand-Held refractometer is the first to be equipped with Automatic Temperature Compensation and Water Resistant (IP65) at the same time. While featuring functions such as Easy-to-Read, Easy-to-Hold, Smooth sampling, Easy disposal of sample from the edge, the improvement of hygiene aspect by employing the new type of grip, and well balanced structure, emphasis is also placed on its design, well exemplified by the streamlined body and the strong grip with rich texture.

Scale range	: Brix 0.0 to 33.0% (Automatic Temperature Compensation)
Minimum scale	: 0.2%
Accuracy	: $\pm 0.2\%$ (10 to 30°C)
Repeatability	: Brix $\pm 0.1\%$
International protection class	: IP65 (except eye piece)
Size and weight	: 3.3×3.3×20.4cm, 160g



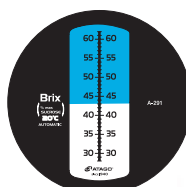
MASTER SERIES REFRACTOMETER (WATER RESISTANT & A.T.C.)

NEW

MASTER-2 α Cat.No. 2321

MASTER-2 α is mid-range measurement range Brix 28.0 to 62.0% model of the MASTER- α . It is convenient for measuring a variety of sauces, soy sauce, seasoning in liquid form as well as for low-sugar jams and spreads. It is an Automatic Temperature Compensation (A.T.C.) model with water resistant properties (IP65).

Scale range	: Brix 28.0 to 62.0% (Automatic Temperature Compensation)
Minimum scale	: 0.2%
Accuracy	: $\pm 0.2\%$ (10 to 30°C)
Repeatability	: Brix $\pm 0.1\%$
International protection class	: IP65 (except eye piece)
Size and weight	: 3.3×3.3×20.4cm, 160g



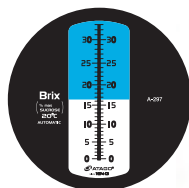
MASTER SERIES REFRACTOMETER (A.T.C.)

NEW

MASTER-T Cat.No. 2312

This is the successor model to the conventional ATC-1E. Automatic Temperature Compensation feature only. The Master-T is a good alternative choice when the water resistant feature is not a priority.

Scale range	: Brix 0.0 to 33.0% (Automatic Temperature Compensation)
Minimum scale	: 0.2%
Accuracy	: $\pm 0.2\%$ (10 to 30°C)
Repeatability	: Brix $\pm 0.1\%$
Size and weight	: 3.3×3.3×20.4cm, 160g



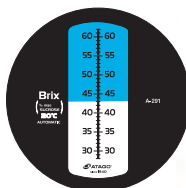
MASTER SERIES REFRACTOMETER (A.T.C.)

NEW

MASTER-2T Cat.No. 2322

MASTER-2T is mid-range model of the MASTER-T. Automatic Temperature Compensation feature only. The Master-T is a good alternative choice when the water resistant feature is not a priority.

Scale range	: Brix 28.0 to 62.0% (Automatic Temperature Compensation)
Minimum scale	: 0.2%
Accuracy	: $\pm 0.2\%$ (10 to 30°C)
Repeatability	: Brix $\pm 0.1\%$
Size and weight	: 3.3×3.3×20.4cm, 160g



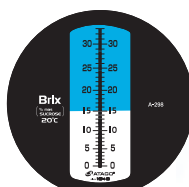
MASTER SERIES REFRACTOMETER

NEW

MASTER-M Cat.No. 2313

This is the successor model to the conventional N-1 α . The Master-M is a good alternative choice when the water resistant feature is not a priority and the Temperature Compensation will be carried out manually. Not equipped with the Automatic Temperature Compensation feature.

Scale range	: Brix 0.0 to 33.0%
Minimum Scale	: 0.2%
Size and weight	: 3.3×3.3×20.4cm, 160g



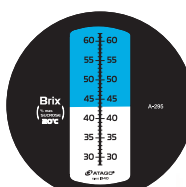
MASTER SERIES REFRACTOMETER

NEW

MASTER-2M Cat.No. 2323

MASTER-2M is mid-range measurement range Brix 28.0 to 62.0% model of the MASTER-M. The Master-M is a good alternative choice when the water resistant feature is not a priority and the Temperature Compensation will be carried out manually.

Scale range	: Brix 28.0 to 62.0%
Minimum Scale	: 0.2%
Size and weight	: 3.3×3.3×20.4cm, 160g



MASTER SERIES REFRACTOMETER (Water Resistant & A.T.C.)

MASTER-3 α Cat.No.2331 MASTER-4 α Cat.No.2341

NEW

MASTER-3 α , MASTER-4 α are high-range model of the MASTER- α . The MASTER-3 α , MASTER-4 α are suited for use with food products of high sugar content such as malt, honey, jam, marmalade, etc

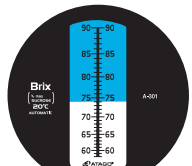
Scale range :MASTER-3 α Brix 58.0% to 90.0%
MASTER-4 α Brix 45.0% to 82.0%

Minimum scale :Brix0.2%

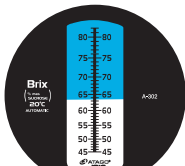
Accuracy :Brix \pm 0.2% (10 to 40°C)

Repeatability :Brix \pm 0.1%

Size and weight :3.3 \times 3.3 \times 16.8cm,120g



MASTER-3 α



MASTER-4 α

MASTER SERIES REFRACTOMETER (A.T.C.)

MASTER-3T Cat.No.2332 MASTER-4T Cat.No.2342

NEW

MASTER-3T, MASTER-4T are high-range model of the MASTER-T. Automatic Temperature Compensation feature only.

MASTER-3T, MASTER-4T are a good alternative choice when the water resistant feature is not a priority.

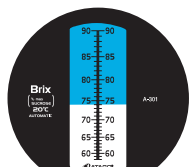
Scale range :MASTER-3T Brix 58.0% to 90.0%
MASTER-4T Brix 45.0% to 82.0%

Minimum scale :Brix0.2%

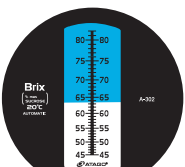
Accuracy :Brix \pm 0.2% (10 to 40°C)

Repeatability :Brix \pm 0.1%

Size and weight :3.3 \times 3.3 \times 16.8cm,120g



MASTER-3T



MASTER-4T

MASTER SERIES REFRACTOMETER

MASTER-3M Cat.No.2333 MASTER-4M Cat.No.2343

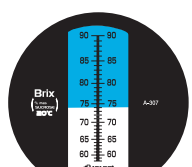
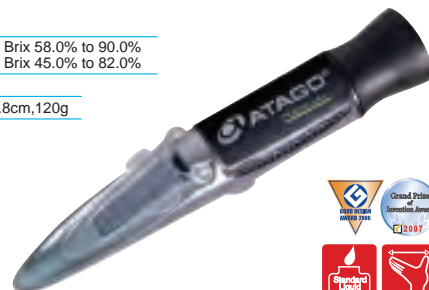
NEW

MASTER-3M, MASTER-4M are high-range model of the MASTER-M. MASTER-3M, MASTER-4M are a good alternative choice when the water resistant feature is not a priority and the Temperature Compensation will be carried out manually.

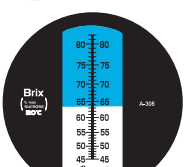
Scale range :MASTER-3M Brix 58.0% to 90.0%
MASTER-4M Brix 45.0% to 82.0%

Minimum scale :Brix0.2%

Size and weight :3.3 \times 3.3 \times 16.8cm,120g



MASTER-3M



MASTER-4M

MASTER SERIES REFRACTOMETER (Water Resistant & A.T.C.)

MASTER-53 α Cat.No. 2351

NEW

MASTER-53 α is wide range model of the MASTER- α . MASTER-53 α is capable of measuring not only various kinds of juice, coffee, and other beverages but also processed food such as sauce, ketchup, low calorie jam, etc. It is an Automatic Temperature Compensation (A.T.C.) model with water resistant feature (IP65).

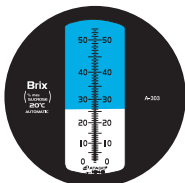
Scale range :0.0% to 53.0%

Minimum scale :Brix0.5%

Accuracy :Brix \pm 0.5% (10 to 30°C)

Repeatability :Brix \pm 0.25%

Size and weight :3.3 \times 3.3 \times 16.8cm,120g



MASTER SERIES REFRACTOMETER (A.T.C.)

MASTER-53T Cat.No.2352

NEW

MASTER-53T is wide range model of the MASTER-T. MASTER-53T is capable of measuring not only various kinds of juice, coffee, and other beverages but also processed food such as sauce, ketchup, low calorie jam, etc. It is an Automatic Temperature Compensation (A.T.C.) model. The Master-53T is a good alternative choice when the water resistant feature is not a priority.

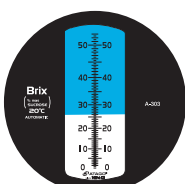
Scale range :MASTER-53T Brix0.0% to 53.0%

Minimum scale :Brix0.5%

Accuracy :Brix \pm 0.5% (10 to 30°C)

Repeatability :Brix \pm 0.25%

Size and weight :3.3 \times 3.3 \times 16.8cm,120g



MASTER SERIES REFRACTOMETER

MASTER-53M Cat.No.2353

NEW

MASTER-53M is wide range model of the MASTER-M. The MASTER-53M is a good alternative choice when the water resistant feature is not a priority and the Temperature Compensation will be carried out manually.

Scale range :Brix0.0% to 53.0%

Minimum scale :Brix0.5%

Size and weight :3.3 \times 3.3 \times 16.8cm,120g



MASTER SERIES REFRACTOMETER

MASTER-RI Cat.No.2612

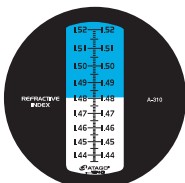
NEW

MASTER-RI is refractive-index model of the MASTER-Series. MASTER-RI can be used for measuring the refractive index of vegetable oil, petroleum, oil slicks, etc.

Scale range :Refractive index 1.435 to 1.520

Minimum scale :Refractive index 0.001

Size and weight :3.3 \times 3.3 \times 16.8cm,120g



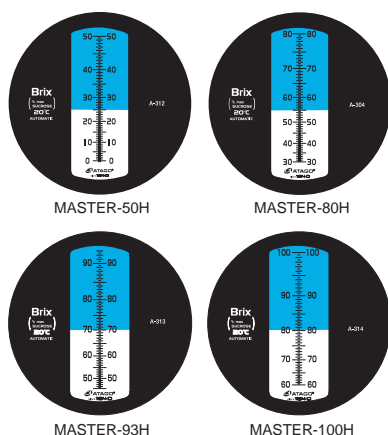
MASTER SERIES REFRACTOMETER (Water Resistant & A.T.C. -Heat Resistant model-)

NEW

MASTER-50H Cat.No.2354
MASTER-80H Cat.No.2364
MASTER-93H Cat.No.2374
MASTER-100H Cat.No.2384

MASTER-H Series are the Heat models of the MASTER- α series. Designed for measuring high-temperature samples during cooking or boiling process at production sites. Corrosion resistant tempered glass prism are adopted to provide an extended service life.

Scale range	:MASTER-50H Brix 0.0% to 50.0% MASTER-80H Brix 30.0% to 80.0% MASTER-93H Brix 45.0% to 93.0% MASTER-100H Brix 60.0% to 100.0%
Minimum scale	:Brix0.5%
Accuracy	:Brix $\pm 0.5\%$
Size and weight	:3.3 \times 3.3 \times 16.8cm,120g

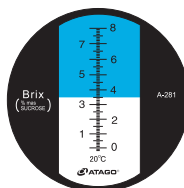


HAND-HELD REFRACTOMETER

N-8 α Cat.No. 2360

The N-8 α is especially developed for very low concentration solution, Brix 8% or less. A special light filter is in place to allow for higher contrast to view the boundary line.

Scale range	: Brix 0.0 to 8.0%
Minimum scale	: 0.1%
Size and weight	: 4 \times 4 \times 21cm, 260g



HAND-HELD REFRACTOMETERS

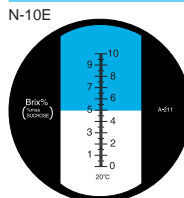
N-10E Cat.No. 2151, N-20E Cat.No. 2161

AUTOMATIC TEMPERATURE COMPENSATING TYPE REFRACTOMETER

ATC-20E Cat.No. 2323

The N-10E is a model developed for very low concentration use where the Brix is 10% or less. The scale is big, and precise measurements are possible. Good for measurements of low concentration fruit juices, etc.

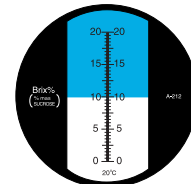
Scale range	: Brix 0.0 to 10.0%
Minimum scale	: 0.1%
Size and weight	: 4 \times 4 \times 20cm, 200g



Scale range	: Brix 0.0 to 20.0%
Minimum scale	: 0.1%
Size and weight	: 4 \times 4 \times 20cm, 200g

N-20E/ATC-20E

The N-20E and ATC-20E are widely used for measuring the concentration of low density aqueous solutions such as tomato juices, fruit juice, cola, etc. The ATC-20E is an Automatic Temperature Compensating type refractometer which automatically provides correct measurement values of 20°C.



MASTER SERIES WINE REFRACTOMETER

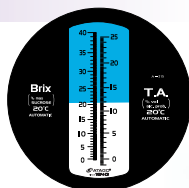
The MASTER-Series Wine Refractometers are used for measuring grape must concentrations.



MASTER SERIES WINE REFRACTOMETER (A. T. C. and Water Resistant)

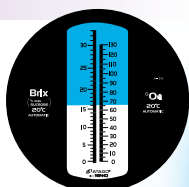
MASTER-TA Cat.No.2590

Scale range	:T.A. 0.0 to 25.0% Brix 0.0% to 40.0%
Minimum scale	:T.A. 0.2% Brix 0.2%
Accuracy	:T.A. $\pm 0.3\%$ (10 to 30°C) Brix $\pm 0.5\%$
Size and weight	:3.3 \times 3.3 \times 20.4cm,160g



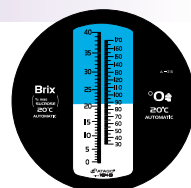
MASTER-OE Cat.No.2591

Scale range	:Oe. 0.0 to 130° Brix 0.0 to 33.0%
Minimum scale	:Oechsle 1° Brix 0.2%
Accuracy	:Oechsle $\pm 1^\circ$ Brix $\pm 0.2\%$ (10 to 30°C)
Size and weight	:3.3 \times 3.3 \times 20.4cm,160g



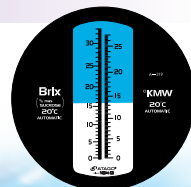
MASTER-GOE Cat.No.2592

Scale range	:German Oechsle 30 to 170° Brix 0.0 to 40.0%
Minimum scale	:German Oechsle 1° Brix 0.2%
Accuracy	:German Oechsle $\pm 2^\circ$ Brix $\pm 0.5\%$ (10 to 30°C)
Size and weight	:3.3 \times 3.3 \times 20.4cm,160g



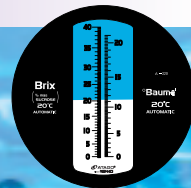
MASTER-KMW Cat.No.2593

Scale range	:KMW 0.0 to 27.0° Brix 0.0 to 33.0%
Minimum scale	:KMW 0.2° Brix 0.2%
Accuracy	:KMW 0.2° Brix $\pm 0.2\%$ (10 to 30°C)
Size and weight	:3.3 \times 3.3 \times 20.4cm,160g



MASTER-BAUME Cat.No.2594

Scale range	:Baume 0.0 to 21.0° Brix 0.0 to 40.0%
Minimum scale	:Baume 0.2° Brix 0.2%
Accuracy	:Baume $\pm 0.3^\circ$ Brix $\pm 0.5\%$ (10 to 30°C)
Size and weight	:3.3 \times 3.3 \times 20.4cm,160g



NEW

SALINITY REFRACTOMETERS

S-10E Cat.No. 2412, S-28E Cat.No. 2422

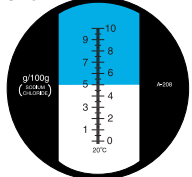
The S-10E and the S-28E are salt concentration refractometers with special scales. The units can be used for controlling the concentration of saltwater used in rinsing seafood or salinity in cooking.

Scale range : 0.0 to 10.0% sodium chloride

Minimum scale : 0.1%

Size and weight : 4×4×20cm, 200g

S-10E

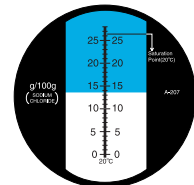


Scale range : 0.0 to 28.0% sodium chloride

Minimum scale : 0.2%

Size and weight : 4×4×18cm, 170g

S-28E



SALINITY REFRACTOMETERS (sea water) / ATC TYPE SALINITY REFRACTOMETERS (sea water)

S/Mill-E Cat.No. 2442, ATC-S/Mill-E Cat.No. 2444

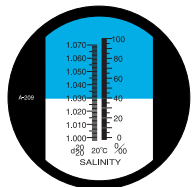
The S/Mill-E density meter measures the salinity and the specific gravity of sea water. The salinity of sea water is displayed in parts per mille (‰) unit. The ATC-S/Mill-E model is designed with the Automatic Temperature Compensation feature which automatically provides the measurement values at the compensated temperature of 20°C (compensation range 10 to 30°C).

Scale range : Salinity 0.0 to 100.0‰
Specific gravity 1.000 to 1.070

Minimum scale : Salinity 1‰
Specific gravity 0.001

Accuracy : (ATC-S/Mill-E) Salinity ±1‰
Specific gravity ±0.001 (10 to 30°C)

Size and weight : 4×4×20cm, 200g



S/Mill-E

ATC-S/Mill-E

HAND-HELD REFRACTOMETERS (full range)

HSR-500 Cat.No. 2340, R-5000 Cat.No. 2350

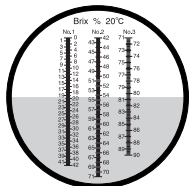
The refractive index of a sugar solution is in proportion to sugar concentration. The model HSR-500 uses this principle, where a transmitting system is applied, to measure within a full range of Brix (0.0-90.0%). The R-5000 can be used for simple, quick and easy measurements of refractive index.

HSR-500

Scale range : Brix 0.0 to 90%
(3-stage switching)

Minimum scale : 0.2%

Size and weight : 4×4×20cm, 600g

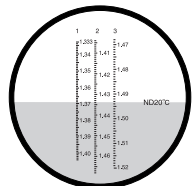


R-5000

Scale range : nD 1.333 to 1.520
(3-stage switching)

Minimum scale : 0.001

Size and weight : 4×4×20cm, 600g

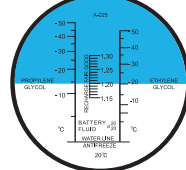


BATTERY COOLANT CHECKERS

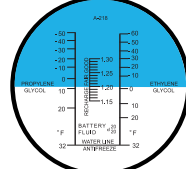
BC-2E Cat.No. 2832, BC-3E Cat.No. 2842

This refractometer has an exclusive scale for measuring specific gravity of battery fluid and for checking the freezing temperature of ethylene glycol and propylene glycol which are used as antifreeze mixture in automobiles, thermal catalyst for solar power systems and other industrial applications. The scale of the model BC-2E is graduated in °C while that of the BC-3E is in °F.

BC-2E



BC-3E



BC-2E

BC-3E

Scale range : Ethylene glycol 0 to -50°C 32 to -60°F
Propylene glycol 0 to -50°C 32 to -50°F

Battery fluid d₂₀²⁰ 1.150 to 1.300

Size and weight : 4×4×14cm, 140g

COOLANT REFRACTOMETER

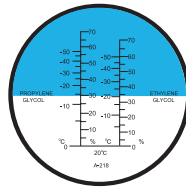
BR-1E Cat.No. 2821

This refractometer can be used for measuring the concentration and freezing temperature of ethylene glycol and propylene glycol which are used as anti-freeze mixture for automobiles, thermal catalyst for solar power systems, and other industrial applications. Designed with a dual scale, the BR-1E is ideal for field measurement.

Scale range : Ethylene glycol 0 to 70%, 0 to -50°C
Propylene glycol 0 to 70%, 0 to -50°C

Minimum scale : 5%, 5°C

Size and weight : 4×4×14cm, 140g



HAND-HELD ALCOHOL REFRACTOMETER

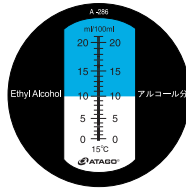
AL-21α Cat.No. 2361

Designed ideally to measure pure alcohol and alcohol after distillation.

Scale range : Ethyl Alcohol Concentration 0.0 to 21.0% (ml/100ml)

Minimum scale : 0.2% (Resolution 0.1%)

Size and weight : 4×4×21cm, 260g



HAND-HELD HONEY REFRACTOMETER

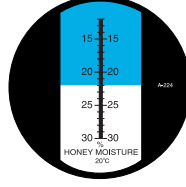
HHR-2N Cat.No. 2522

The honey refractometer is specially designed to determine the percentage of water contained in honey.

Scale range : 12.0 to 30.0% (water content in honey)

Minimum scale : 0.1%

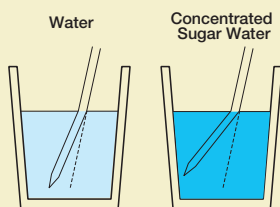
Size and weight : 4×4×17cm, 260g



Technical Information

Light Refraction

When a straw is placed into a glass of water, the straw appears bent. Now if a straw is placed in a glass with water containing dissolved sugar, the straw should appear even more bent (see illustrations). This phenomenon is known as the principle of light refraction. Refractometers are measuring instruments which put this phenomenon of light refraction to practical use. They are based on the principle that as the density of a substance increases (e.g. when sugar is dissolved in water), its refractive index (how much the straw appears bent)

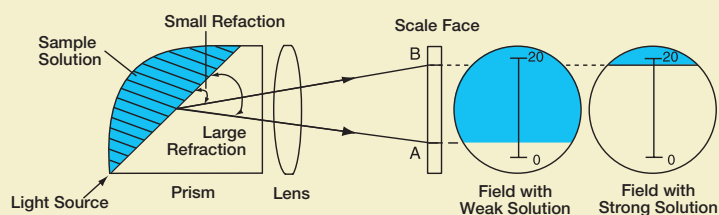


risks proportionately. Refractometers were devised by Dr. Ernst Abbe, a German/Austrian scientist in the early 20th century.

Principles of Refractometers

The detection system for hand-held refractometers (transparent system) is summarized below.

- (1) In the figure below the detection is done by utilizing the refractive phenomenon produced on the boundary of the prism and sample. The refractive index of the prism is much larger than that of the sample.
- (2) If the sample is thin, the angle of refraction is large (see line "A") because of the large difference in refractive index between the prism and the sample.
- (3) If the sample is thick, the angle of refraction is small (see line "B") because of the small difference in refractive index between the prism and the sample.



Which Refractometer to choose

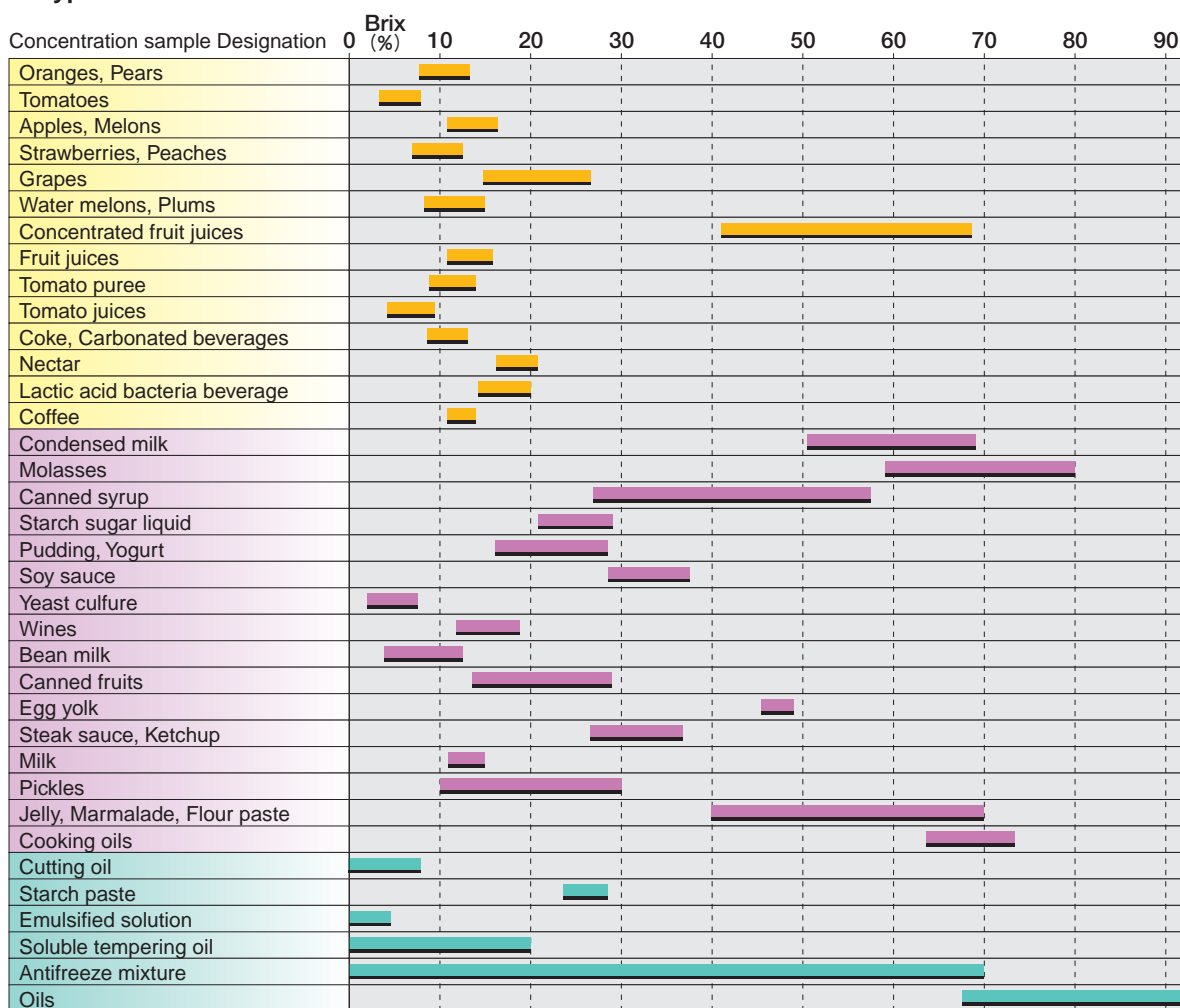
Please use as a guide with a chart of back page when you choose the refractometer.

Known sample's typical concentration

Fruits,
Fruit juices,
Soft Drinks

Food
Industry

Chemical
Industry

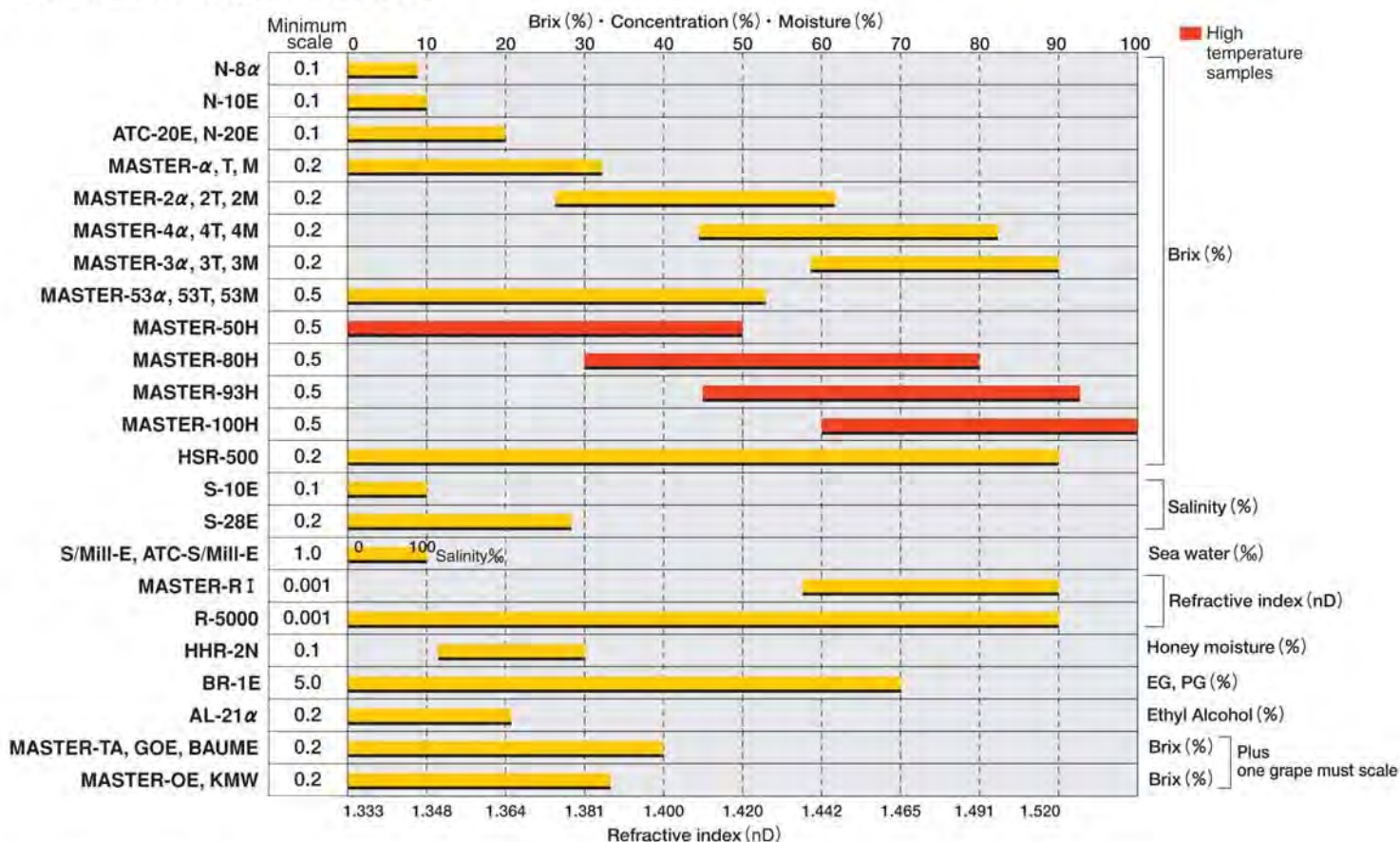


About the Brix (%) Scale

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.

Measurement range for each model



EXPLANATION OF ICONS Icons for functions, specifications and scales have been added to this catalog.

<ul style="list-style-type: none"> * Automatic Temperature Compensation * Compensation automatique de température * Automatische Temperaturkompensation * Compensazione automatica della temperatura * Compensación de automática de temperatura * 自動温度補償 	<ul style="list-style-type: none"> * External Light Interference * Interférence de la lumière externe * Äußere Lichteinflüsse * Interferenza della luce esterna * Luz de Interferencia Externa * 外部光線干渉 	<ul style="list-style-type: none"> * High temperature samples * Résistant à la chaleur * Hitzbeständig * Resistente al calore * Muestras De Alta Temperatura * 高温様品用
<ul style="list-style-type: none"> * Calibration with exclusive standard liquid * Calibration 1 point sur solution standard * Kalibrierung mit speziellem Standard * Calibration 1 point sur solution standard * Calibración con patrones líquidos especiales * 使用專屬標準液調整 	<ul style="list-style-type: none"> * Calibration with water * Calibration 1 point* sur eau distillée * Kalibrierung mit Wasser * Calibrazione con acqua * Calibración con agua * 用水歸零 	<ul style="list-style-type: none"> * Compact and easy to carry * Portable * Leicht und einfach zu tragen * Calibración con líquidos standard exclusivos * Compacto y fácil de llevar * 輕巧易於攜帶
<ul style="list-style-type: none"> * Digital display * Affichage numérique * Digital Anzeige * Display digitale * Pantalla digital * 數字顯示 	<ul style="list-style-type: none"> * Battery operated * Alimentation par pile * Batteriebetrieben * Alimentazione a batteria * Funcionamiento con batería * 使用電池操作 	<ul style="list-style-type: none"> * Refractive index scale * Indice de réfraction * Skala fuer Refractive Index * Indice di rifrazione * Escala de índice de refracción * 折射率刻度
<ul style="list-style-type: none"> * Salt concentration scale * Teneur en sel * Skala fuer Salzkonzentration * Salinità% * Escala de concentración salina * 鹽分濃度刻度 	<ul style="list-style-type: none"> * Seawater scale * Spécial eau de mer * Seewasserskala * Salinità o/oo * Escala de agua de mar * 海水刻度 	<ul style="list-style-type: none"> * Wine scale * Spécial viticulture * Skala fuer Wein * Scale Enologia * Escala de vinos * 葡萄酒刻度

All ATAGO refractometers are designed and manufactured in Japan.

HACCP G.M.P. G.L.P. ATAGO products are acknowledged by HACCP, G.M.P. and G.L.P. systems.

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* Specifications and appearance are subject to change without notice.

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