



## Hand-held Refractometers

MASTER of REFRACTOMETRY

 **ATAGO**<sup>®</sup>



# 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), 069244 (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                          |
|---|--|---|-------------------------------|--------------------------------------|--------------------------------|---------|--------------------------------|
| <b>Brix</b>                                   |  | <b>Sea water</b>                            |                               | <b>Chemical product's ingredient</b> |                                |         |                                |
| PAL-1   | Brix (0.0~53.0%)                                     | PAL-07S                                     | Sea water (S.G.)              | PAL-23S                              | Glycerin (Low concentration)   | PAL-23S | Glycerin (Low concentration)   |
| PAL-2   | Brix (45.0~93.0%)                                    | PAL-08S                                     | Sea water (Baume)             | PAL-24S                              | Glycerin (High concentration)  | PAL-24S | Glycerin (High concentration)  |
| PAL-3   | Brix (0.0~93.0%)                                     | <b>Food additives, Ingredients</b>          |                               | PAL-30S                              | Acetic acid                    | PAL-30S | Acetic acid                    |
| PAL-α   | Brix (0.0~85.0%)                                     | PAL-29S                                     | Citric acid                   | PAL-32S                              | Phosphoric acid                | PAL-31S | Formic acid                    |
| <b>Sugars</b>                                 |  | PAL-30S                                     | Acetic acid                   | PAL-42S                              | Cesium chloride                | PAL-32S | Phosphoric acid                |
| PAL-12S                                       | Dextran  | PAL-32S                                     | Phosphoric acid               | PAL-44S                              | Lithium chloride               | PAL-44S | Lithium chloride               |
| PAL-14S                                       | Fructose   | PAL-64S                                     | Sodium bicarbonate            | PAL-45S                              | Barium chloride                | PAL-45S | Barium chloride                |
| PAL-15S                                       | Glucose  | PAL-65S                                     | Sodium tartrate               | PAL-46S                              | Cobalt chloride                | PAL-46S | Cobalt chloride                |
| PAL-16S                                       | High Fructose Corn Syrup (HFCS-42)                   | PAL-70S                                     | Potassium phosphate           | PAL-47S                              | Ferric chloride                | PAL-47S | Ferric chloride                |
| PAL-17S                                       | High Fructose Corn Syrup (HFCS-55)                   | <b>Alcohol liquid</b>                       |                               | PAL-48S                              | Strontium chloride             | PAL-48S | Strontium chloride             |
| PAL-18S                                       | Inverted sugar                                       | PAL-34S                                     | Ethyl alcohol                 | PAL-49S                              | Potassium chloride             | PAL-49S | Potassium chloride             |
| PAL-19S                                       | Lactose  | PAL-36S                                     | Methyl alcohol                | PAL-50S                              | Potassium bromide              | PAL-50S | Potassium bromide              |
| PAL-20S                                       | Maltose  | PAL-37S                                     | Isopropyl alcohol             | PAL-51S                              | Sodium bromide                 | PAL-51S | Sodium bromide                 |
| <b>Honey</b>                                  |  | PAL-85S                                     | Polyvinyl alcohol             | PAL-52S                              | Potassium iodide               | PAL-52S | Potassium iodide               |
| PAL-22S                                       | Honey moisture                                       | <b>Pharmaceutical reagents, Ingredients</b> |                               | PAL-53S                              | Copper sulfate (Concentration) | PAL-53S | Copper sulfate (Concentration) |
| <b>Soy milk, Bittern (Magnesium chloride)</b> |  | PAL-12S                                     | Dextran                       | PAL-54S                              | Copper sulfate (S.G.)          | PAL-54S | Copper sulfate (S.G.)          |
| PAL-27S                                       | Soy milk   | PAL-13S                                     | Creatine                      | PAL-55S                              | Magnesium sulfate              | PAL-55S | Magnesium sulfate              |
| PAL-43S                                       | Bittern (Magnesium chloride)                         | PAL-23S                                     | Glycerin (Low concentration)  | PAL-56S                              | Potassium sulfate              | PAL-56S | Potassium sulfate              |
| <b>Cooking</b>                                |  | PAL-24S                                     | Glycerin (High concentration) | PAL-57S                              | Nickel sulfate                 | PAL-57S | Nickel sulfate                 |
| PAL-96S                                       | Chinese noodle soup / Baume of kansui (Double scale) | PAL-25S                                     | Inulin                        | PAL-58S                              | Sodium nitrate                 | PAL-58S | Sodium nitrate                 |
| PAL-98S                                       | Condiment  | PAL-26S                                     | Mannitol                      | PAL-59S                              | Zinc sulfate                   | PAL-59S | Zinc sulfate                   |
| PAL-Pâtissier                                 | Brix / Baume (Double scale) <b>NEW</b>               | PAL-31S                                     | Formic acid                   | PAL-60S                              | Silver nitrate                 | PAL-60S | Silver nitrate                 |
| <b>Salinity</b>                               |  | PAL-32S                                     | Phosphoric acid               | PAL-61S                              | Sodium nitrate                 | PAL-61S | Sodium nitrate                 |
| PAL-03S                                       | Sodium chloride (g/100g)                             | PAL-51S                                     | Sodium bromide                | PAL-62S                              | Potassium carbonate            | PAL-62S | Potassium carbonate            |
| PAL-106S                                      | Sodium chloride (g/100ml)                            | PAL-55S                                     | Magnesium sulfate             | PAL-63S                              | Sodium carbonate               | PAL-63S | Sodium carbonate               |
| PAL-04S                                       | Sodium chloride (S.G.)                               | PAL-64S                                     | Sodium bicarbonate            | PAL-64S                              | Sodium bicarbonate             | PAL-64S | Sodium bicarbonate             |
| PAL-05S                                       | Sodium chloride (Baume)                              | PAL-65S                                     | Sodium tartrate               | PAL-67S                              | Potassium chromate             | PAL-67S | Potassium chromate             |
| <b>Sea water</b>                              |  | PAL-66S                                     | Potassium oxalate             | PAL-68S                              | Potassium dichromate           | PAL-68S | Potassium dichromate           |
| PAL-06S                                       | Sea water (Concentration)                            | PAL-68S                                     | Potassium dichromate          | PAL-69S                              | Sodium thiosulfate             | PAL-69S | Sodium thiosulfate             |
| <b>Wine</b>                                   |  | PAL-70S                                     | Potassium phosphate           | PAL-70S                              | Potassium phosphate            | PAL-70S | Potassium phosphate            |
| PAL-79S                                       | T.A. 1990  | PAL-72S                                     | Sodium tungstate              | PAL-71S                              | Sodium molybdate               | PAL-71S | Sodium molybdate               |
| <b>Artificial leather, Fabric</b>             |  |   |                               | PAL-72S                              | Sodium tungstate               |         |                                |
| PAL-38S                                       | Dimethyl formamide                                   |   |                               |                                      |                                |         |                                |
| <b>Paste</b>                                  |  |   |                               |                                      |                                |         |                                |
| PAL-21S                                       | Dextrin  |   |                               |                                      |                                |         |                                |
| <b>Cutting oil</b>                            |  |   |                               |                                      |                                |         |                                |
| PAL-102S                                      | Cutting oil  |   |                               |                                      |                                |         |                                |
| <b>Refractive index</b>                       |  |   |                               |                                      |                                |         |                                |
| PAL-RI  | Refractive index                                     |   |                               |                                      |                                |         |                                |





# 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<br>MASTER-2M<br>MASTER-3M<br>MASTER-4M<br>MASTER-53M<br>MASTER-Ri (nD) | MASTER- $\alpha$<br>MASTER-2 $\alpha$<br>MASTER-3 $\alpha$<br>MASTER-4 $\alpha$<br>MASTER-53 $\alpha$ | MASTER-T<br>MASTER-2T<br>MASTER-3T<br>MASTER-4T<br>MASTER-53T | MASTER-50H<br>MASTER-80H<br>MASTER-93H<br>MASTER-100H  |

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

##### MASTER- $\alpha$ Cat.No. 2311

NEW

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%<br>(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                | : 3.3X3.3X20.4cm, 160g                                      |



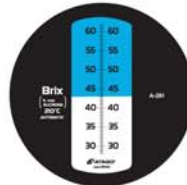
#### MASTER SERIES REFRACTOMETER (WATER RESISTANT & A.T.C.)

##### MASTER-2 $\alpha$ Cat.No. 2321

NEW

MASTER-2 $\alpha$  is mid-range measurement range Brix 28.0 to 62.0% model of the MASTER- $\alpha$ . 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%<br>(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                | : 3.3X3.3X20.4cm, 160g                                       |



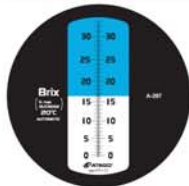
#### MASTER SERIES REFRACTOMETER (A.T.C.)

##### MASTER-T Cat.No. 2312

NEW

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%<br>(Automatic Temperature Compensation) |
| Minimum scale   | : 0.2%  |
| Accuracy        | : $\pm 0.2\%$ (10 to 30°C)                                  |
| Repeatability   | : Brix $\pm 0.1\%$  |
| Size and weight | : 3.3X3.3X20.4cm, 160g                                      |



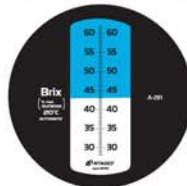
#### MASTER SERIES REFRACTOMETER (A.T.C.)

##### MASTER-2T Cat.No. 2322

NEW

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%<br>(Automatic Temperature Compensation) |
| Minimum scale   | : 0.2%   |
| Accuracy        | : $\pm 0.2\%$ (10 to 30°C)                                   |
| Repeatability   | : Brix $\pm 0.1\%$   |
| Size and weight | : 3.3X3.3X20.4cm, 160g                                       |



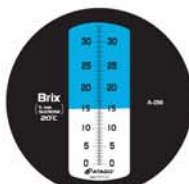
#### MASTER SERIES REFRACTOMETER

##### MASTER-M Cat.No. 2313

NEW

This is the successor model to the conventional N-1 $\alpha$ . 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 | : 3.3X3.3X20.4cm, 160g |



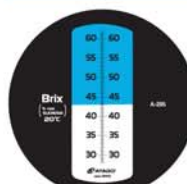
#### MASTER SERIES REFRACTOMETER

##### MASTER-2M Cat.No. 2323

NEW

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 | : 3.3X3.3X20.4cm, 160g |





**MASTER SERIES REFRACTOMETER (Water Resistant & A.T.C.)** **NEW**  
**MASTER-3 $\alpha$**  Cat.No.2331 **MASTER-4 $\alpha$**  Cat.No.2341

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

|                 |   |
|-----------------|---|
| Scale range     | :MASTER-3 $\alpha$ Brix 58.0% to 90.0%<br>MASTER-4 $\alpha$ 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 $\alpha$



MASTER-4 $\alpha$

**MASTER SERIES REFRACTOMETER (A.T.C.)** **NEW**  
**MASTER-3T** Cat.No.2332 **MASTER-4T** Cat.No.2342

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%<br>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

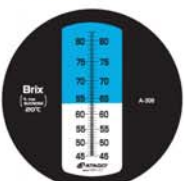
**MASTER SERIES REFRACTOMETER** **NEW**  
**MASTER-3M** Cat.No.2333 **MASTER-4M** Cat.No.2343

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%<br>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

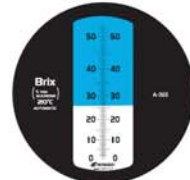


MASTER-4M

**MASTER SERIES REFRACTOMETER (Water Resistant & A.T.C.)** **NEW**  
**MASTER-53 $\alpha$**  Cat.No. 2351

MASTER-53 $\alpha$  is wide range model of the MASTER- $\alpha$ . MASTER-53 $\alpha$  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).

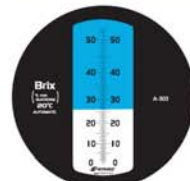
|                 |  |
|-----------------|--|
| Scale range     | :0.0% to 53.0%                         |
| Minimum scale   | :Brix0.5%                              |
| Accuracy        | :Brix $\pm$ 0.5% (10 to 30°C)          |
| Repeatability   | :Brix $\pm$ 0.25%                      |
| Size and weight | :3.3 $\times$ 3.3 $\times$ 16.8cm,120g |



**MASTER SERIES REFRACTOMETER (A.T.C.)** **NEW**  
**MASTER-53T** Cat.No.2352

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.

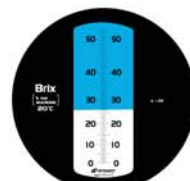
|                 |  |
|-----------------|--|
| Scale range     | :MASTER-53T Brix0.0% to 53.0%          |
| Minimum scale   | :Brix0.5%                              |
| Accuracy        | :Brix $\pm$ 0.5% (10 to 30°C)          |
| Repeatability   | :Brix $\pm$ 0.25%                      |
| Size and weight | :3.3 $\times$ 3.3 $\times$ 16.8cm,120g |



**MASTER SERIES REFRACTOMETER** **NEW**  
**MASTER-53M** Cat.No.2353

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.

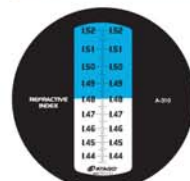
|                 |  |
|-----------------|--|
| Scale range     | :Brix0.0% to 53.0%                     |
| Minimum scale   | :Brix0.5%                              |
| Size and weight | :3.3 $\times$ 3.3 $\times$ 16.8cm,120g |



**MASTER SERIES REFRACTOMETER** **NEW**  
**MASTER-RI** Cat.No.2612

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**

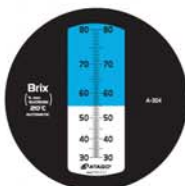
- MASTER-50H** Cat.No.2354
- MASTER-80H** Cat.No.2364
- MASTER-93H** Cat.No.2374
- MASTER-100H** Cat.No.2384

MASTER-H Series are the Heat models of the MASTER- $\alpha$  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 |



MASTER-50H



MASTER-80H



MASTER-93H



MASTER-100H

**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°                      |
|                 | Brix $\pm$ 0.2% (10 to 30°C)           |
| Size and weight | :3.3 $\times$ 3.3 $\times$ 20.4cm,160g |

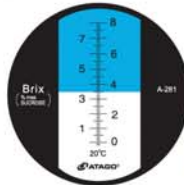


**HAND-HELD REFRACTOMETER**

**N-8 $\alpha$**  Cat.No. 2360

The N-8 $\alpha$  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**

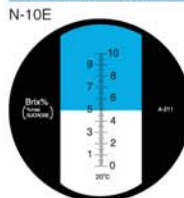
**N-10E** Cat.No. 2151, **N-20E** Cat.No. 2161

**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.

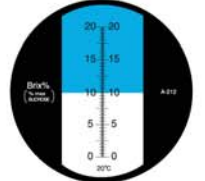
|                 |                                    |
|-----------------|------------------------------------|
| Scale range     | : Brix 0.0 to 10.0%                |
| Minimum scale   | : 0.1%                             |
| Size and weight | : 4 $\times$ 4 $\times$ 20cm, 200g |



|                 |                                    |
|-----------------|------------------------------------|
| 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**

**NEW**

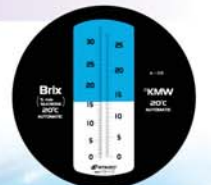
**MASTER-GOE** Cat.No.2592

|                 |  |
|-----------------|--|
| 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°               |
|                 | 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°                      |
|                 | Brix $\pm$ 0.5% (10 to 30°C)           |
| Size and weight | :3.3 $\times$ 3.3 $\times$ 20.4cm,160g |





## SALINITY REFRACTOMETERS

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

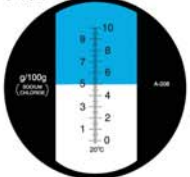
The S-10E and the S-28E are salt concentration refractometers with special scales. The units can be used for controlling the concentration of saltwater used in rinsing seafood or salinity in cooking.

Scale range : 0.0 to 10.0% sodium chloride

Minimum scale : 0.1%

Size and weight : 4×4×20cm, 200g

S-10E

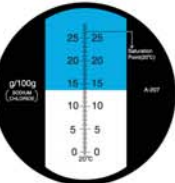


Scale range : 0.0 to 28.0% sodium chloride

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**

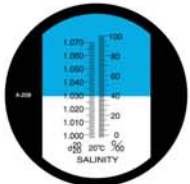
The S/Mill-E density meter measures the salinity and the specific gravity of sea water. The salinity of sea water is displayed in parts per mille (‰) unit. The ATC-S/Mill-E model is designed with the Automatic Temperature Compensation feature which automatically provides the measurement values at the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

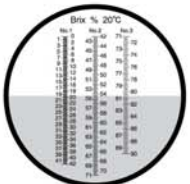
HSR-500



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

Minimum scale : 0.2%

Size and weight : 4×4×20cm, 600g



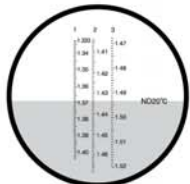
R-5000



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

Minimum scale : 0.001

Size and weight : 4×4×20cm, 600g

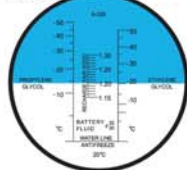


## BATTERY COOLANT CHECKERS

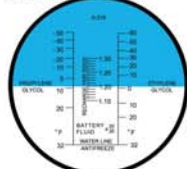
**BC-2E Cat.No. 2832, BC-3E Cat.No. 2842**

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 d<sub>20</sub> 1.150 to 1.300

Size and weight : 4×4×14cm, 140g

## COOLANT REFRACTOMETER

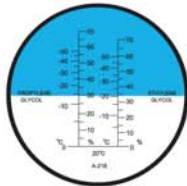
**BR-1E Cat.No. 2821**

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

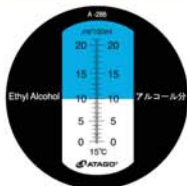
**AL-21α Cat.No. 2361**

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

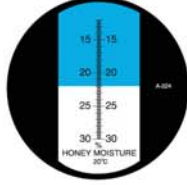
**HHR-2N Cat.No. 2522**

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

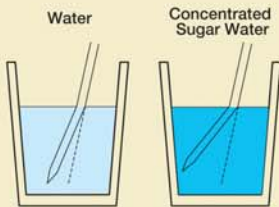




# Technical Information

## Light Refraction

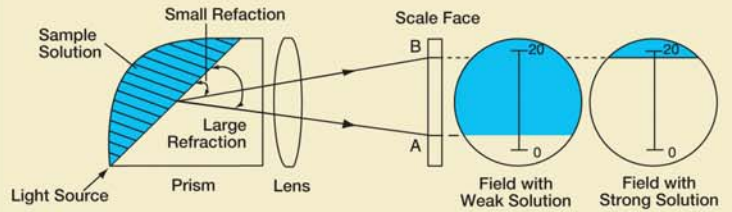
When a straw is placed into a glass of water, the straw appears bent. Now if a straw is placed in a glass with water containing dissolved sugar, the straw should appear even more bent (see illustrations). This phenomenon is known as the principle of light refraction. Refractometers are measuring instruments 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) rises 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

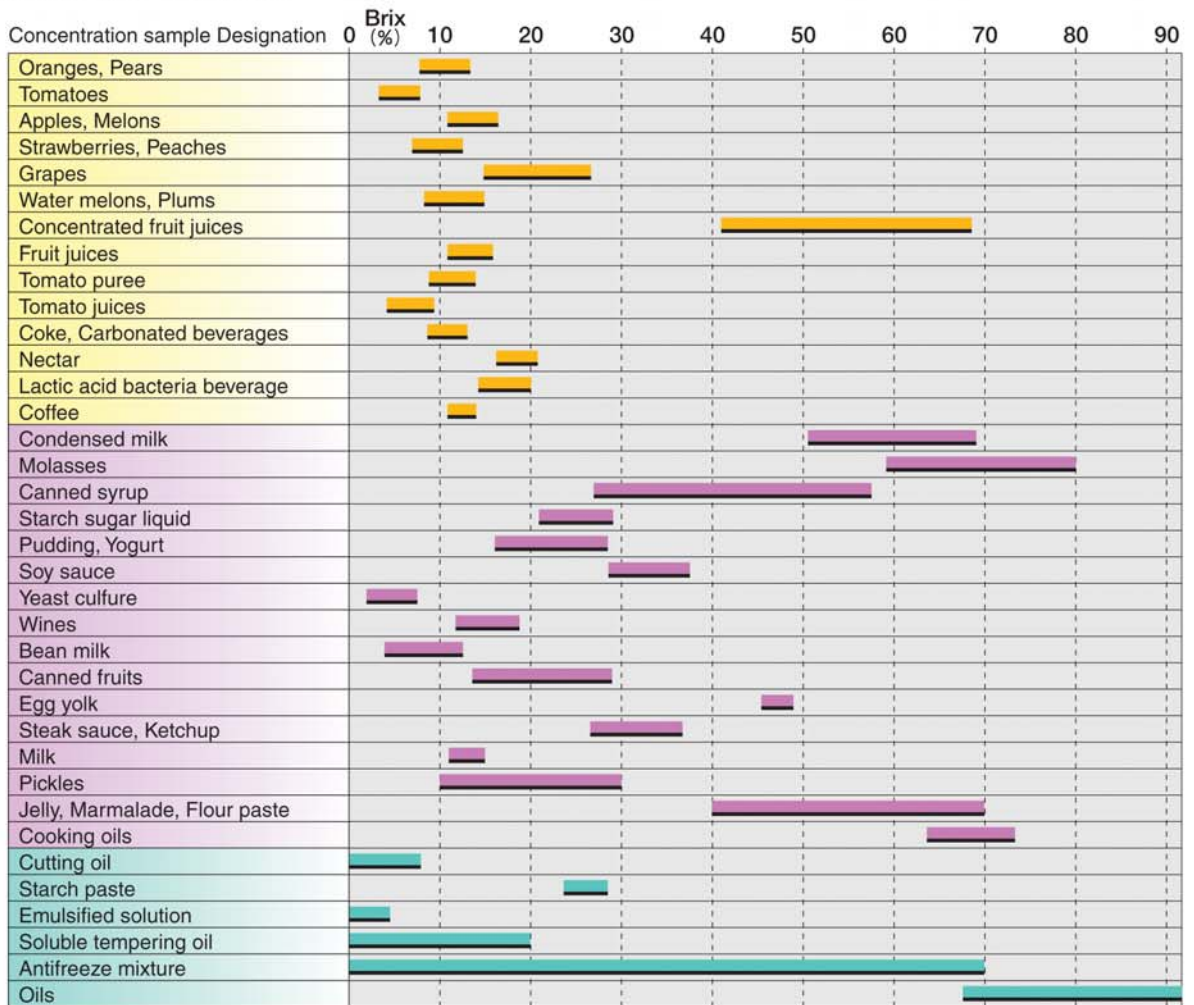
Please use as a guide with a chart of back page when you choose the refractometer.

### Known sample's typical concentration

Fruits,  
Fruit juices,  
Soft Drinks

Food  
Industry

Chemical  
Industry

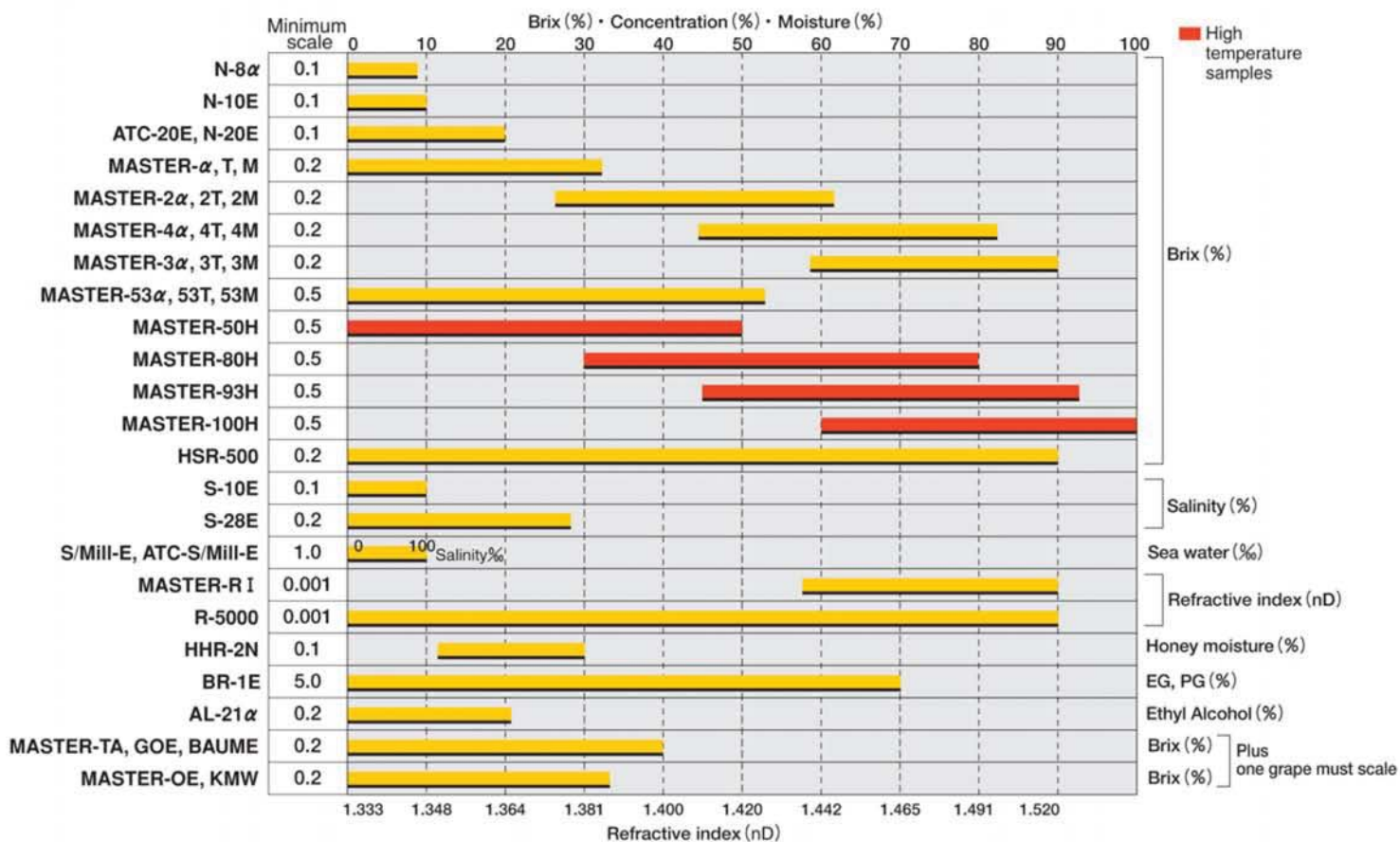


### About the Brix (%) Scale

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

All ATAGO refractometers are designed and manufactured in Japan.

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

**ATAGO CO., LTD.**

Headquarters: The Front Tower Shiba Koen, 23rd Floor  
2-6-3 Shiba-koen, Minato-ku, Tokyo 105-0011, Japan  
TEL : 81-3-3431-1943 FAX : 81-3-3431-1945  
overseas@atago.net http://www.atago.net/

**ATAGO U.S.A., Inc.**

TEL : 1-425-637-2107 customerservice@atago-usa.com

**ATAGO INDIA Instruments Pvt. Ltd.**

TEL : 91-22-2833-8038 / 8076 customerservice@atago-india.com

**ATAGO (THAILAND) Co., Ltd.**

TEL : 662-982-8718-9 customerservice@atago-thailand.com

**ATAGO BRASIL Ltda.**

TEL : 55 16 3916-6000 customerservice@atago-brasil.com

**ATAGO ITALIA s.r.l.**

TEL : 39 2 36557267 customerservice@atago-italia.com

**ATAGO CHINA Guangzhou Co., Ltd.**

TEL : 86 20-38106065 info@atago-china.com



\* Specifications and appearance are subject to change without notice.