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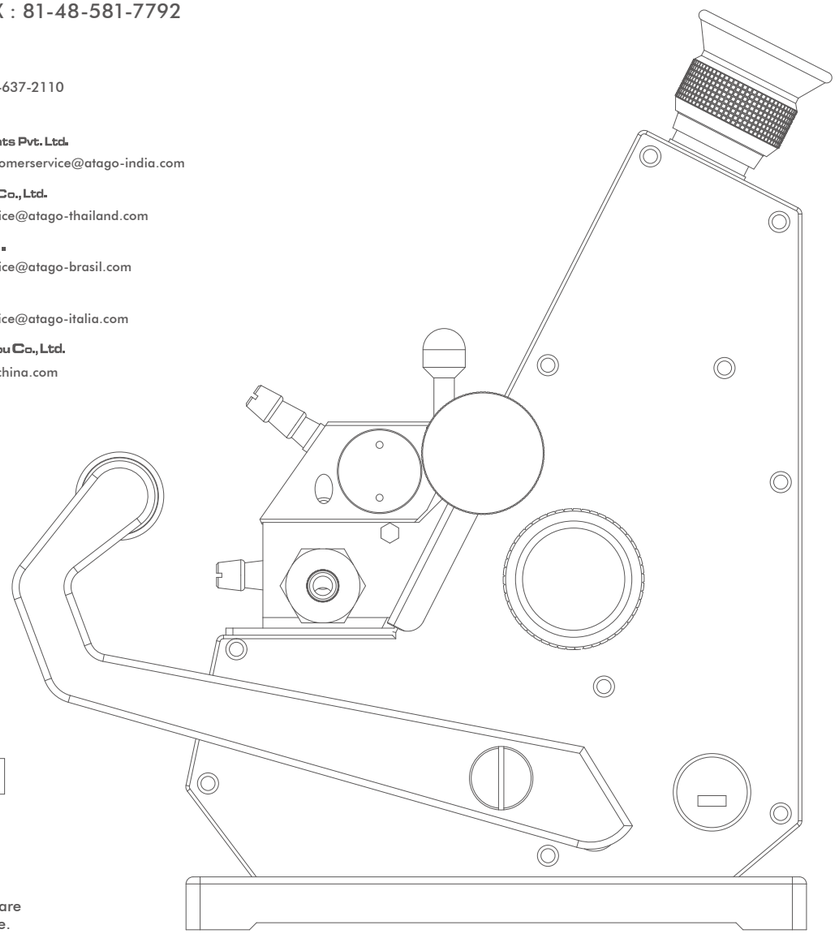


JAB CM035 ASR REGISTERED FIRM ISO9001 Q0981 ISO9001 REGISTERED H.Q. & Factory

HACCP GMP GLP

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

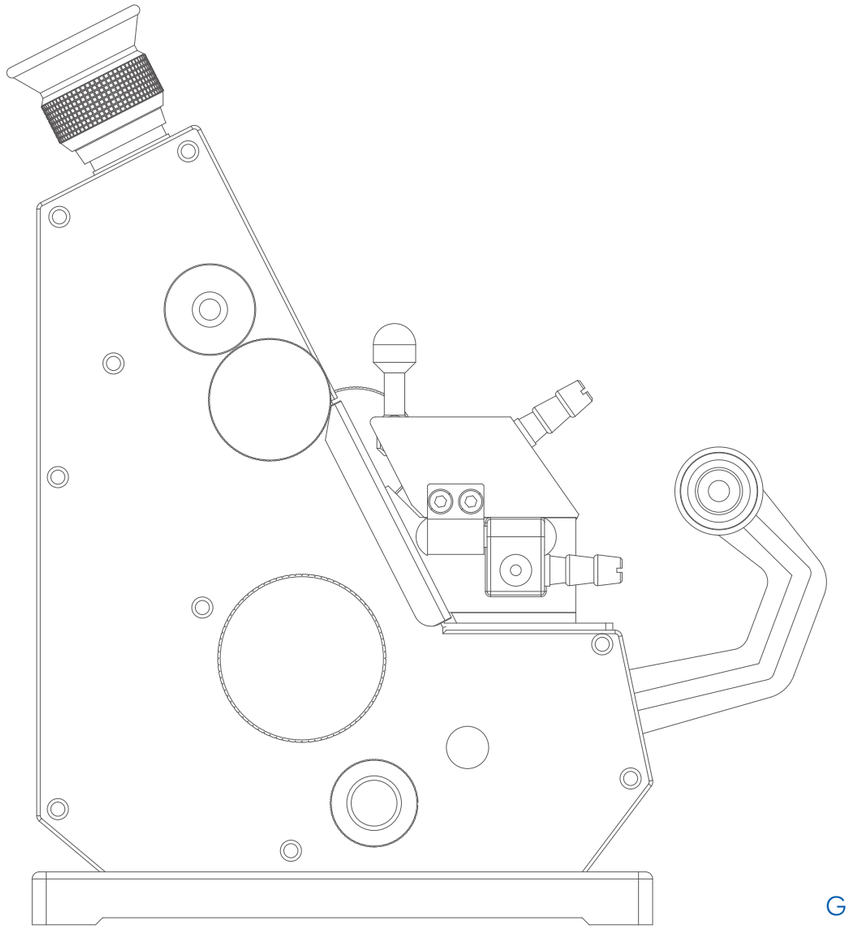
2013

ATAGO®

All ATAGO Refractometers and Polarimeters are designed and manufactured in Japan.

ATAGO®
Since 1940

Proudly made in Japan 100%™



GENERAL CATALOG

Made

With

Japanese

Quality.

World's Top Refractometers & Polarimeters

Why Choose ATAGO?

1. Proud Heritage and Experience

ATAGO has over 70 years of experience in optical instrument manufacturing. With our expertise cultivated over decades, as well as an extensive selection of instruments, we can meet a variety of measurement needs including highly specialized industries.

2. Industry-Leading Technology

Refraction of light has been our sole specialty throughout the existence of ATAGO, and we strive for perfection in optical systems. We listen to end-user feedback from 154 countries and continuously push the limit of refractometry.

3. Trusted Product Support

We dedicate ourselves on the high durability and low failure rate of ATAGO products. Our repair service is carried out in a timely manner. Calibration certificates are available.

ATAGO's Fukaya-Factory (Japan)

Index

ATAGO provides optimal quality control solutions for a wide variety of markets ranging from food and beverage to pharmaceutical and industrial applications.

Choose the product best suited to your business needs from our wide selection.

Digital Bench-top Refractometer
DIGITAL REFRACTOMETER
RX-α/ i series
Fully automatic, Peltier temperature-controlled models provide the highest level of accuracy for QC and research laboratories.
P.8

Digital Bench-top Refractometer
DIGITAL DIFFERENTIAL REFRACTOMETER
DD-7
Differential technology provides extremely accurate measurements of low-concentration liquids.
P.14

Digital Bench-top Refractometer
AUTOMATIC REFRACTOMETER
SMART-1
Full-range 0-95% Brix model comes standard with additional invert sugar and high fructose corn syrup scales.
P.15

Digital Portable Refractometer (Standard)
POCKET REFRACTOMETER
PAL series
Take it anywhere and use it anytime. Operation is as simple as pressing of a button with the compact but robust 'Pocket' series.
P.16

Analog Portable Refractometer
HAND-HELD REFRACTOMETER
MASTER series
Look through the eyepiece and see for yourself how the conventional measurement style has been redefined and modernized.
P.21

pH / EC METER
DPH-2 / DEC-2
P.28

SOIL MOISTURE METER
PAL-Soil
P.29

Wine
PAL / Palette / MASTER
P.30

ACIDITY METER
PAL-ACID1/ 2/ 3/ 4
P.32

SALT METER
PAL-ES2 / PAL-ES3 / ES-421
Digital salt meters utilize the electric conductivity method and require no reagent. Safe, fast, and simple way to check salt % (g/100g) is perfect for use on the production floor.
P.34

Digital Portable Refractometer (Special)
DIP-TYPE REFRACTOMETER
PEN-PRO
Unique dip-in design eliminates the need for pipettes and spoons, allowing for fast measurements of multiple batches.
P.36

Digital Portable Refractometer (Special)
SUCTION-TYPE REFRACTOMETER
QR-Brix
Revolutionary suction-style models are ideal for safe measurements of harmful liquids.
P.37

Digital Portable Refractometer (Special)
DIGITAL REFRACTOMETER
Palette series
Never compromise performance for portability. The series offer accurate readings and programmable user scale.
P.38

Digital Portable Refractometer (Special)
IMMERSION REFRACTOMETER
PAN-1
Continuous concentration monitor hooks up on the rim of a simmering pot or mixing container.
P.40

Process Refractometer
IN-LINE REFRACTOMETER
PRM / CM series
P.42

Analog Bench-top Refractometer
ABBE REFRACTOMETER
ABBE series
P.46

Clinical
PAL / Palette / MASTER / PEN
P.52

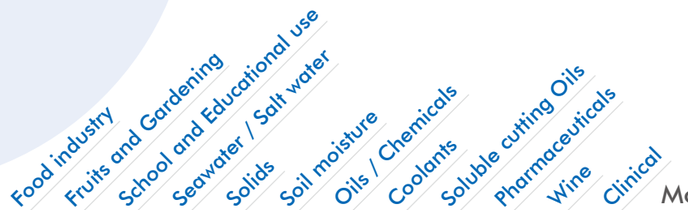
POLARIMETER
SAC-i / POL-½ / AP-300 / POLAX-2L
P.56

VISCOMETER
BASE / BASE PLus / PRO / PRO Graphic
P.62

Accessories

Quick Guide

Which model is best suited for your needs ?



Model	Scale	Price	Page	Feature
RX-α / i	nD / Brix	Hi	8-	Automatic digital refractometers of the world's highest standard
DD-7	nD / Brix	Hi	14	Digital differential refractometer to monitor low-concentration liquids
SMART-1	nD / Brix etc	Hi	15	Automatic digital refractometer with full-range Brix and other sugar scales
PAL	Brix / Spl	Low	16-	Palm-fitting digital refractometers with robust washable body
MASTER	Brix / Spl	Low	21-	Basic analogue refractometers tailored to various needs
DPH-2 / DEC-2	pH / EC	Low	28	Portable waterproof pH meter and EC meter
PAL-Soil	Soil moisture	Low	29	Soil moisture meter with dual gravimetric and volumetric scales
For Wine	Spl	Low to Mid	30-	Refractometers for grapes to estimate the alcohol content in finished wine
PAL-ACID1/ 2/ 3/ 4	Acidity	Low	32-	Portable total acidity meter for various foods, fruits, and vegetables
PAL-ES2&3 / ES-421	Salt content	Low	34-	Easy, fast, and simple salt meter with electric conductivity method
PEN-PRO	Brix	Low	36	Pen-type digital refractometers with continuous measurement
QR-Brix	Brix	Low	37	Digital suction-type refractometer for hazardous or volatile samples
Palette	Brix / Spl	Low to Mid	38-	Smart and compact digital refractometers with 2 year warranty
PAN-1	Brix	Mid	40-	Digital immersion refractometer to monitor the concentration continuously
CM / PRM	nD / Brix	Mid to Hi	42-	In-process refractive index / Brix monitors for automation
ABBE	nD / Brix	Mid to Hi	46-	Analog bench-top refractometers for highly specialized laboratories
For Clinical	Spl	Low	52-	Various refractometers for sports players and hospital/veterinary use
SAC-i / POL-½ / AP / POLAX-2L	Angle of rotation	Mid to Hi	56-	Automatic / semi-automatic polarimeters at affordable prices
BASE / BASE Plus / PRO / PRO Graphic	Viscosity	Mid to Hi	62-	Viscometer

ATAGO® DIGITAL REFRACTOMETER

RX-α Series

The World's Highest Standard of Technology Stemming from Over Half a Century of Expertise.

NEW **FDA 21 CFR Part 11 Software Included in Standerd Delivery.**

- Measurement History
- Programmable User Scale
- Resolve Measurement Value Discrepancy
- Password Security
  (RX-5000α-Plus, RX-5000α, RX-5000α-Bev)
- Built-in Peltier Thermo-module

3 year warranty

RX-αand RX-i comes standard with a two (2) year limited warranty against manufacturer's defects from the date of the original purchase. The warranty period can be extended to three (3) years if the product is registered with ATAGO.

4 Measurement Mode Options

MODE-1 For maximum accuracy
Displays the measurement value once the sample reaches the target temperature.

MODE-2 For fast results
Measures Refractive Index and temperature at fixed intervals and displays the estimated measurement value at the target temperature.

MODE-S For emulsion samples
Displays the measurement value once a certain level of sample stability is achieved.

MODE-3 For no temperature control
Provides an option to turn the thermo-module off. Without temperature control, the measurement value is displayed in 4 seconds after the START key is pressed.

Calibration solutions on Page 51

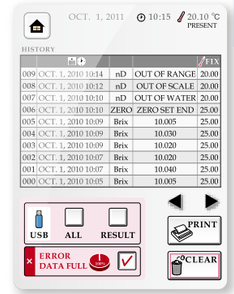
RX series conforms to ASTM Standards (P.51)

RX-i Series

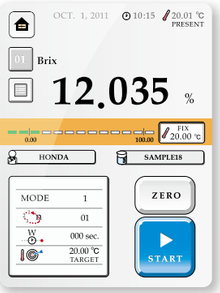
RX-series with Touchscreen. ATAGO taking refractometers to the next level.

Additional upgrades from the RX-α

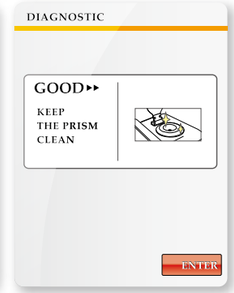
- Icons
- Touchscreen
- USB Flash Drive
- Self-diagnosis
- Sound
- User Scale



Measurement History



Measurement Screen



Self-diagnosis

Optional Accessories

MAGIC™

■RE-56180 MAGIC™ (metal)
■RE-56185 MAGIC™ (resin)

Used for measuring volatile substances.
Choose either metal or resin. (Excluding RX-5000α-Bev, 007α and 5000)

Funnel-type Flow Cell

■RE-56172
5000α-Plus, 5000α, 5000i-Plus, and 5000i
■RE-56173
9000α, 7000α, 9000i, and 7000i

Save time with the flow cell!
No need to clean the prism between measurements.

The wetted parts can be customized with materials that are resistant to corrosive chemicals. P.50

Optional printers are:
DP-RX and DP-RD P.50

Calibration solutions on Page 51

Digital Bench-top Refractometer
Digital Portable Refractometer (Standard)
Analog Portable Refractometer
pH Meter EC Meter
Soil Moisture Meter
Wine
Acidity Meter
Salt Meter
Digital Portable Refractometer (Special)
In-line/process Refractometer
Analog Bench-top Refractometer
Clinical
Polarimeter
Viscometer

ATAGO® DIGITAL REFRACTOMETER

Wide nD High Accuracy

Wide Range, High Temperature, and Accuracy

RX-9000α

Cat.No.3263

The RX-9000α(alpha) is a fully automatic digital refractometer with high accuracy and wide measurement range. This instrument is suitable for multiple sample types.

RNG :	Refractive Index (nD) 1.32500 to 1.70000 Brix 0.00 to 100.00% (ATC)
ACC :	Refractive Index (nD) ±0.00004 *±0.00002 (nD 1.33299 to1.42009, 10 to 30℃. For other ranges, (nD) ±0.00010 *±0.00005) Brix ±0.03% *±0.01% (Brix 0.00 to 50.00%, 10 to 30℃) ±0.05% *±0.01% (Brix 50.01 to 95.00%, 10 to 30℃. For other ranges, Brix ±0.10% *±0.02%) Temp ±0.05℃
TMP :	5.00 to 70.00℃
RES :	Refractive Index (nD) 0.00001 Brix 0.01% Temp 0.01℃
SCL :	30

Wide nD

Wide Range and High Temperature

RX-7000α

Cat.No.3262

The RX-7000α(alpha) features wider measurement ranges for refractive index and temperature. Best for oils and fats with high melting points, aroma oils of high refractive index, and organic solvents.

RNG :	Refractive Index (nD) 1.32500 to 1.70000 Brix 0.00 to 100.00% (ATC)
ACC :	Refractive Index (nD) ±0.0001 *±0.00005 Brix ±0.1% *±0.02% Temp ±0.05℃
TMP :	5.00 to 70.00℃
RES :	Refractive Index (nD) 0.00001 (0.0001) Brix 0.01% (0.1%) (Factory default setting) Temp 0.01℃
SCL :	30

No.1 Brix

Most Accurate and Full Range

RX-5000α-Plus

Cat.No.3266

The RX-5000α(alpha)-Plus features improved accuracy over the RX-5000α(alpha) with ±0.010% Brix and Refractive Index ±0.00002.

RNG :	Refractive Index (nD) 1.32700 to 1.58000 Brix 0.000 to 100.000% (ATC)
ACC :	Refractive Index (nD) ±0.00002 *±0.00001 Brix ±0.010% *±0.010% Temp ±0.05℃
TMP :	5.00 to 60.00℃
RES :	Refractive Index (nD) 0.00001 Brix 0.005% Temp 0.01℃
SCL :	60

Calibration solutions on Page 51

Flat Stage

Flat Sample Stage

RX-5000α-Bev

Cat.No.3271

The RX-5000α(alpha)-Bev is ideal for measuring beverages. A flat sample stage makes it easier to wipe off the sample and allows for faster and easier clean up.

RNG :	Refractive Index (nD) 1.32700 to 1.58000 Brix 0.00 to 100.00% (ATC)
ACC :	Refractive Index (nD) ±0.00004 *±0.00002 Brix ±0.03% *±0.01% Temp ±0.05℃
TMP :	5.00 to 60.00℃
RES :	Refractive Index (nD) 0.00001 Brix 0.01% Temp 0.01℃
SCL :	60

No.1 Sales

ATAGO's Flagship Model

RX-5000α

Cat.No.3261

The RX-5000α(alpha) is a reliable cost effective instrument. An excellent alternative to traditional Abbe refractometers and essential to any QC/QA lab.

RNG :	Refractive Index (nD) 1.32700 to 1.58000 Brix 0.00 to 100.00% (ATC)
ACC :	Refractive Index (nD) ±0.00004 *±0.00002 Brix ±0.03% *±0.01% Temp ±0.05℃
TMP :	5.00 to 60.00℃
RES :	Refractive Index (nD) 0.00001 Brix 0.01% Temp 0.01℃
SCL :	60

● Reference

RNG	Measurement range (ATC = Automatic Temperature Compensation)
ACC	Measurement accuracy *Repeatability ※When measuring a standard sucrose solution of up to 50% Brix or standard refractive index solution in MODE-1 at 20℃.
TMP	Measurement temperature
RES	Resolution
SCL	User programmable scales

● Common Specifications

Materials	Sample stage - SUS 316 Prism - Artificial sapphire
Power supply	AC100V to 240V, 50/60Hz
Power Consumption	65VA
Output	Printer and PC (via RS-232C)
Dimensions and weight	37×26×14cm, 6.4kg (RX-9000α and 7000α 6.8kg)

RX series optional printers are : DP-RX and DP-RD P.50

Calibration solutions on Page 51

Digital Bench-top Refractometer
Digital Portable Refractometer (Standard)
Analog Portable Refractometer
pH Meter EC Meter
Soil Moisture Meter
Wine
Acidity Meter
Salt Meter
Digital Portable Refractometer (Special)
In-line/process Refractometer
Analog Bench-top Refractometer
Clinical
Polarimeter
Viscometer

ATAGO® DIGITAL REFRACTOMETER

Low Concentration

RX-007α

Cat.No.3921

The RX-007α(alpha) is suitable for measuring water soluble samples with very low concentration (5.000% or less) at a very high accuracy of ±0.005%.

RNG :	Refractive Index (RI) 1.330150 to 1.341500 Brix 0.000 to 5.000% (ATC)
ACC :	Refractive Index (RI) ±0.000010 Brix ±0.005% (under specified ambient temperature and constant temperature)
TMP :	15.00 to 30.00℃
RES :	Refractive Index (RI) 0.000001 Brix 0.001% Temp 0.01℃
SCL :	5

Low Concentration

Water Bath Connectivity

RX-5000

Cat.No.3281

The RX-5000 is not equipped with Peltier thermo-module. A water bath can be connected for temperature control.

RNG :	Refractive Index (nD) 1.32700 to 1.58000 Brix 0.00 to 100.00% (ATC)
ACC :	Refractive Index (nD) ±0.00004 *±0.00002 Brix ±0.03% *±0.01%
TMP :	5.00 to 60.00℃
RES :	Refractive Index (nD) 0.00001 Brix 0.01%
SCL :	30

Circulating constant temperature bath P.50

● Reference

RNG	Measurement range (ATC = Automatic Temperature Compensation)
ACC	Measurement accuracy *Repeatability *When measuring a standard sucrose solution of up to 50% Brix or standard refractive index solution in MODE-1 at 20℃. (except RX-007α)
TMP	Measurement temperature
RES	Resolution
SCL	User programmable scales

● Common Specifications

Materials	Sample stage - SUS 316 Prism - Artificial sapphire (RX-5000), Optical glass (RX-007α)
Power supply	AC100V to 240V, 50/60Hz
Power Consumption	65VA (RX-007α) 30VA (RX-5000) 90VA (RX-i series)
Output	Printer and PC (via RS-232C), Computer - USB (RX-i series)
Dimensions and weight	37×26×14cm (RX-007α 6.7kg, RX-5000 6.4kg, RX-9000i and 7000i 7.0kg, RX-5000i-Plus and 5000i 6.6kg)

RX-007α and RX-i series optional printers are : DP-RX and DP-RD P.50
RX-5000 optional printer is : DP-62(AD) P.50

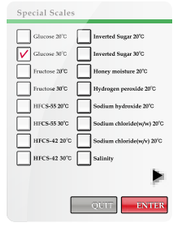
Calibration solutions on Page 51

Touch Panel Models

RX-i series Upgraded Features

Self-diagnosis

The instrument can detect irregularities with the intensity of light or waveforms. Perform this assessment regularly to ensure accurate measurements.



Special Scales

The RX-i series comes pre-programmed with 22 of the most commonly used concentration scales.

Wide Range and High Accuracy

RX-9000i NEW

Cat.No.3278

Wide nD High Accuracy

The RX-9000i features both high accuracy and wide measurement range and comes with newly added functions, such as USB connectivity and self-diagnosis capability.

RNG :	Refractive Index (nD) 1.32422 to 1.70000 Brix 0.00 to 100.00% (ATC)
ACC :	Refractive Index (nD) ±0.00004 *±0.00002 (nD 1.33299 to1.42009, 10 to 30℃. For other ranges, (nD) ±0.00010 *±0.00005) Brix ±0.03% *±0.01% (Brix 0.00 to 50.00%, 10 to 30℃) ±0.05% *±0.01% (Brix 50.01 to 95.00%, 10 to 30℃. For other ranges, Brix ±0.10% *±0.02%) Temp ±0.05℃
TMP :	5.00 to 75.00℃
RES :	Refractive Index (nD) 0.00001 Brix 0.01% Temp 0.01℃
SCL :	100

Wide Range

RX-7000i

Cat.No.3279

Wide nD

The RX-7000i features wide measurement range and the intuitive touch screen technology.

RNG :	Refractive Index (nD) 1.32422 to 1.70000 Brix 0.00 to 100.00% (ATC)
ACC :	Refractive Index (nD) ±0.0001 *±0.00005 Brix ±0.1% *±0.02% Temp ±0.05℃
TMP :	5.00 to 75.00℃
RES :	Refractive Index (nD) 0.00001 (0.0001) Brix 0.01% (0.1%) (Factory default setting) Temp 0.01℃
SCL :	100

Most Accurate and Full Range

RX-5000i-Plus

Cat.No.3275

No.1 Brix

The RX-5000i-Plus of the most accurate refractometer in the world is now even more stylish, smart, and functional.

RNG :	Refractive Index (nD) 1.32422 to 1.58000 Brix 0.000 to 100.000% (ATC)
ACC :	Refractive Index (nD) ±0.00002 *±0.00001 Brix ±0.010% *±0.010% Temp ±0.05℃
TMP :	5.00 to 75.00℃
RES :	Refractive Index (nD) 0.00001 Brix 0.005% Temp 0.01℃
SCL :	100

ATAGO's Flagship Model

RX-5000i

Cat.No.3276

No.1 Sales

The RX-5000i measures with the same accuracy level as the RX-5000α(alpha) and provides reliable measurements with newly added functions and the touch screen operation.

RNG :	Refractive Index (nD) 1.32422 to 1.58000 Brix 0.00 to 100.00% (ATC)
ACC :	Refractive Index (nD) ±0.00004 *±0.00002 Brix ±0.03% *±0.01% Temp ±0.05℃
TMP :	5.00 to 75.00℃
RES :	Refractive Index (nD) 0.00001 Brix 0.01% Temp 0.01℃
SCL :	100

Calibration solutions on Page 51

ATAGO® DIGITAL DIFFERENTIAL REFRACTOMETER

DD-7

The Ultimate Answer For Monitoring Low-Concentration Liquids.

The Digital Differential Refractometer DD-7 measures solutions of up to 2.000% Brix concentration at the extremely high-accuracy level of 0.005% Brix by measuring the difference in concentrations of 2 solutions.

Applications

- Tea
- Unsweetened or diet beverages
- Coffee or herbal extracts
- Surfactants

(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 ±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.

Digital Differential Refractometer

DD-7 Cat.No.3930

Measurement range	0.000 to 2.000% (for sucrose solution) It is possible to measure samples with refractive index up to 1.50 (nD) by reference solution
Resolution	0.001%
Measurement accuracy	±0.005% (In the case of measurement of sucrose solution (0 to 2%) at 30℃)
Measurement temperature	15.00 to 40.00℃ (The lowerlimit room temperature)
Power supply	AC100V to 240V, 50/60Hz
Power consumption	50VA
Output	Printer and PC (via RS-232C),
Dimensions and weight	36×35×14cm, 5.8kg

DD-7 Optional printers are : DP-63 and DP-RD P.50

Calibration solutions on Page 51

ATAGO® AUTOMATIC REFRACTOMETER

SMART-1

Wide Brix Range Plus Three Additional Scales Preinstalled.

The SMART-1 is an automatic refractometer that can measure a wide range of samples. Featured pre-programmed scales: Brix, Inverted Sugar, HFCS-42, and HFCS-55.

Applications

- Beverages
- Food
- Sugar syrups, corn syrups
- Pharmaceutical ingredients

Measurement Method

1. Place sample on the surface of the prism.

2. Press and release the START key one time.

3. The measured value is displayed.

Features

- Wide measurement range of 0.00 to 95.00%
- High accuracy of ±0.05%
- Automatic Temperature Compensation (ATC) from 5 to 40°C
- 4 pre-installed scales: Brix, inverted sugar, HFCS-55 (High Fructose Corn Syrup) and HFCS-42 (High Fructose Corn Syrup)
- Secondary measurement mode that takes multiple measurements internally and displays a reading once the measurements have stabilized, allowing for hot and cold solutions to be measured with confidence
- 2 data transfer options: printer or computer via RS-232C connection.
- Three-button design (ZERO, START, and SCALE) for simple and efficient operation

Automatic Refractometer

SMART-1 Cat.No.3150

Measurement range	Brix 0.00 to 95.00 (ATC = Automatic Temperature Compensation) Inverted sugar concentration 0.00 to 95.00 (ATC) HFCS-55 (High Fructose Corn Syrup) 0.00 to 95.00 (ATC) HFCS-42 (High Fructose Corn Syrup) 0.00 to 95.00 (ATC)
Resolution	Brix 0.01% Inverted sugar concentration 0.01% HFCS-55 (High Fructose Corn Syrup) 0.01% HFCS-42 (High Fructose Corn Syrup) 0.01%
Measurement accuracy	Brix ±0.05% Inverted sugar concentration ±0.05% HFCS-55 (High Fructose Corn Syrup) ±0.05% HFCS-42 (High Fructose Corn Syrup) ±0.05%
Measurement temperature	5.00 to 40.00℃
Printer	Printer and PC (via RS-232C)
International protection class	IP64 (Excluding AC adapter)
Power supply	AC adapter (AC100 to 240V, 50/60Hz)
Power consumption	15VA
Dimensions and weight	12×27×9cm, 2.0kg (Main unit) 10.5×17.5×4cm, 0.7kg (AC adapter)

SMART-1 optional printer is DP-22 (Before s/n 09283) P.50

Calibration solutions on Page 51

Digital Bench-top Refractometer
Digital Portable Refractometer (Standard)
Analog Portable Refractometer
pH Meter EC Meter
Soil Moisture Meter
Wine
Acidity Meter
Salt Meter
Digital Portable Refractometer (Special)
In-line/process Refractometer
Analog Bench-top Refractometer
Clinical
Polarimeter
Viscometer

PAL Series

GOOD DESIGN AWARD | VENTURE TECHNOLOGY AWARD | TECHNOLOGY FOR FOOD INDUSTRY AWARD

The Original Pocket Refractometer.

NEW Measurement temperature up to 100℃
NEW Temperature display

- Extremely water resistant (IP65)
- Revolutionary new ELI feature
- Calibration with water only
- Light & compact, 100g
- Automatic Temperature Compensation (ATC)
- Ergonomically designed for one-handed operation
- 2 carrying options: strap and case
- Hard plastic storage case
- Will float if accidentally dropped in water
- Can be washed under running water

ELI External Light interference (ELI) Patented

When intense light penetrates the prism of a digital refractometer, the light waves interfere with the sensor, which may lead to inaccurate measurements. To ensure accurate measurement results, the PAL is programmed with the ELI function which displays the [nnn] warning message when intense direct light is detected. Forming a habit of shading the sample stage with your hand and re-pressing the START key (when the warning message from the ELI function is displayed) will ensure accurate measurement results each time.

Measurement Method

Apply 2-3 drops on the Prism surface.

Press the START key.

Measurement value and prism temperature are displayed in 3 seconds!

Optional Accessories

●PAL-case
Part No.RE-39409

●Strap
Part No.RE-39410

●MAGIC™
Part No.RE-39411

Calibration solutions on Page 51

Full Range & High Accuracy

PAL-3 Cat.No.3830 High Accuracy

The PAL-3 has been modified to have a high measurement accuracy at ±0.1% Brix.

RNG :	Brix 0.0 to 93.0%
ACC :	Brix ±0.1% , ±1℃
TMP :	10 to 100℃ (ATC)
RES :	Brix 0.1% , 0.1℃

Wide Brix Range

PAL-α Cat.No.3840 Wide Brix

The PAL-α is a special model with a wide Brix range (0-85%) offered at a very reasonable price.

RNG :	Brix 0.0 to 85.0%
ACC :	Brix ±0.2% , ±1℃
TMP :	10 to 100℃ (ATC)
RES :	Brix 0.1% , 0.1℃

0.0 to 53.0 Brix

PAL-1 Cat.No.3810 No.1 Sales

The PAL-1 works perfectly in measuring almost any fruit juice, food, or drink, such as soup, sauce, ketchup, tomato sauce, and low-sugar jam.

RNG :	Brix 0.0 to 53.0%
ACC :	Brix ±0.2% , ±1℃
TMP :	10 to 100℃ (ATC)
RES :	Brix 0.1% , 0.1℃

High Brix

PAL-2 Cat.No.3820 High Concentration

The PAL-2 can measure various high concentration samples, such as jam, marmalade, jelly, honey, and concentrated juice.

RNG :	Brix 45.0 to 93.0%
ACC :	Brix ±0.2% , ±1℃
TMP :	10 to 100℃ (ATC)
RES :	Brix 0.1% , 0.1℃

Improved Repeatability

PAL-S Cat.No.3860 Mode S

The PAL-S improves repeatability of samples that cause inconsistent readings. Ideal for fatty, dark, and/or emulsion samples, such as dairy products.

RNG :	Brix 0.0 to 93.0%
ACC :	Brix ±0.2% , ±1℃
TMP :	10 to 100℃ (ATC)
RES :	Brix 0.1% , 0.1℃

Standard accessory : MAGIC™

Continuous Measurement

PAL-LOOP Cat.No.3842 Loop

The PAL-LOOP is a special model with new Continuous Measurement feature, which expands on traditional measuring method.

RNG :	Brix 0.0 to 85.0%
ACC :	Brix ±0.2% , ±1℃
TMP :	10 to 100℃ (ATC)
RES :	Brix 0.1% , 0.1℃

● Reference

RNG	Measurement range
ACC	Measurement accuracy
TMP	Measurement temperature
RES	Resolution

● Common Specifications

Ambient temperature	10 to 40℃
Power supply	2×AAA Batteries
International protection class	IP65 Water resistant
Dimensions and weight	5.5×3.1×10.9cm, 100g

※ 10 to 100℃ (Automatic Temperature Compensation) (Hot samples over 100℃ can be measured under specified conditions. Please contact ATAGO for further details.) ※ Temperature display range is 9.0 to 99.9℃.

Calibration solutions on Page 51

ATAGO® POCKET REFRACTOMETER

Brix & Refractive Index

PAL-BX/RI

Cat.No.3852

Dual Scale

Dual scales of Brix (0.0-93.0% full range, ±0.1% accuracy) and Refractive Index (0.0001 nD resolution).

RNG :	Brix (Bx) 0.0 to 93.0%	
	Refractive Index (RI) 1.3306 to 1.5284	
ACC :	Bx ±0.1% , ±1℃	RI ±0.0003 , ±1℃
TMP :	Bx 10 to 100℃ (ATC)	RI 5 to 45℃
RES :	Bx 0.1% , 0.1℃	RI 0.0001 , 0.1℃

Refractive Index

PAL-RI

Cat.No.3850

nD Scale

Suitable for Refractive Index (0.0001 nD resolution) measurement. The Refractive Index and temperature of the sample will continuously scroll across the display.

RNG :	1.3306 to 1.5284
ACC :	±0.0003 , ±1℃
TMP :	5 to 45℃
RES :	0.0001 , 0.1℃

Honey Moisture

PAL-22S

Cat.No.4422

Honey

For measuring the % water content of honey easily and displays readings digitally. Comfortable, easy to use, light & compact.

RNG :	12.0 to 30.0%
ACC :	±0.2% , ±1℃
TMP :	10 to 40℃ (ATC)
RES :	0.1% , 0.1℃

Sodium Chloride (w/w)

PAL-03S

Cat.No.4403

NaCl

For measuring the concentration of sodium chloride in water. Ideal for measuring de-icing fluids, brines, and other salt water.

RNG :	0.0 to 28.0%
ACC :	±0.2% , ±1℃
TMP :	10 to 40℃ (ATC)
RES :	0.1% , 0.1℃

Propylene Glycol (v/v)

PAL-88S/89S

Cat.No.4488,4489

P.G.

For measuring the concentration of propylene glycol concentration and freezing point in °C (88S) or °F (89S).

PAL-88S

RNG :	Co 0.0 to 90.0%	Fr 0 to -50℃
ACC :	Co ±0.4% , ±1℃	Fr ±1℃
TMP :	10 to 40℃ (ATC)	
RES :	Co 0.2% , 0.1℃	Fr 1℃

PAL-89S

RNG :	Co 0.0 to 90.0%	Fr 32 to -60°F
ACC :	Co ±0.4%	Fr ±1°F
TMP :	50 to 104°F (ATC)	
RES :	Co 0.2%	Fr 1°F

Co = Concentration of Propylene glycol
Fr = Freezing point of Propylene glycol

PAL-88S

Ethylene Glycol (v/v)

PAL-91S/92S

Cat.No.4491,4492

E.G.

For measuring the concentration of ethylene glycol concentration and freezing point in °C (91S) or °F (92S).

PAL-91S

RNG :	Co 0.0 to 90.0%	Fr 0 to -50℃
ACC :	Co ±0.4% , ±1℃	Fr ±1℃
TMP :	10 to 40℃ (ATC)	
RES :	Co 0.2% , 0.1℃	Fr 1℃

PAL-92S

RNG :	Co 0.0 to 90.0%	Fr 32 to -60°F
ACC :	Co ±0.4%	Fr ±1°F
TMP :	50 to 104°F (ATC)	
RES :	Co 0.2%	Fr 1°F

Co = Concentration of Ethylene glycol
Fr = Freezing point of Ethylene glycol

PAL-91S

Calibration solutions on Page 51

<Special Scales>

Hydrogen Peroxide (w/w)

PAL-39S

Cat.No.4439

H_2O_2

For measuring the concentration of hydrogen peroxide (H_2O_2) commonly used as a disinfectant.

RNG :	0.0 to 50.0%
ACC :	±0.6% , ±1℃
TMP :	10 to 35℃ (ATC)
RES :	0.2% , 0.1℃

Cutting Oil

PAL-102S

Cat.No.4502

Cutting Oil

For measuring the concentration of cutting oils. Suitable for measuring the percent dilution of hydraulic oil and cleaning liquids.

RNG :	0.0 to 70.0
ACC :	±0.2 , ±1℃
TMP :	10 to 75℃ (ATC)
RES :	0.1 , 0.1℃

Seawater

PAL-06S

Cat.No.4406

Sea Water

For measuring the salinity of seawater. The salinity is displayed in parts per mille(‰). Essential for aquaculture.

RNG :	0 to 100‰
ACC :	±2‰ , ±1℃
TMP :	10 to 40℃ (ATC)
RES :	1‰ , 0.1℃

Brix & Baume

PAL-Pâtissier

Cat.No.4508

Baume

Dual scale of Brix and Baume. Ideal refractometer for pastry chefs. Wide range of 0.0-85.0% Brix.

RNG :	Brix(Bx) 0.0 to 85.0%	Baume(Ba) 0 to 45°
ACC :	Bx ±0.2% , ±1℃	Ba ±1° , ±1℃
TMP :	Bx 10 to 100℃ (ATC)	Ba 10 to 100℃ (ATC)
RES :	Bx 0.1% , 0.1℃	Ba 1° , 0.1℃

Plato

PAL-Plato

Cat.No.4590

Plato

Designed for breweries to measure the wort's percent extract by weight in degrees Plato. Only a small amount of sample required for temperature-compensated readings. Digital display - no more guessing where the line is.

RNG :	0.0 to 30.0°P
ACC :	± 0.2°P , ±1℃
TMP :	10 to 75℃ (ATC)
RES :	0.1°P , 0.1℃

Reference

RNG	Measurement range
ACC	Measurement accuracy
TMP	Measurement temperature
RES	Resolution

Common Specifications

Ambient temperature	10 to 40℃	(PAL-39S 10 to 35℃)
Power supply	2×AAA Batteries	
International protection class	IP65 Water resistant	
Dimensions and weight	5.5×3.1×10.9cm, 100g	

Calibration solutions on Page 51

Digital Bench-top Refractometer
Digital Portable Refractometer (Standard)
Analog Portable Refractometer
pH Meter EC Meter
Soil Moisture Meter
Wine
Acidity Meter
Salt Meter
Digital Portable Refractometer (Special)
In-line/process Refractometer
Analog Bench-top Refractometer
Clinical
Polarimeter
Viscometer

Digital Hand-held "Pocket" Refractometers (special scales)

Cat.No.	Model	Scale
Food, confectionery, Food Ingredients		
4422	PAL-22S	Honey moisture
4508	PAL-Pâtissier	Brix / Baume (Dual scale)
4427	PAL-27S	Soymilk
4443	PAL-43S	Bittern (Magnesium chloride)
4496	PAL-96S	Chinese noodle soup / Baume of Kansui (Dual scale)
4498	PAL-98S	Condiment
4439	PAL-39S	Hydrogen peroxide
4429	PAL-29S	Citric acid
4430	PAL-30S	Acetic acid
4432	PAL-32S	Phosphoric acid
4440	PAL-40S	Sodium hydroxide
4464	PAL-64S	Sodium bicarbonate
4465	PAL-65S	Sodium tartrate
4470	PAL-70S	Potassium phosphate
Fruit and Vegetable Growers		
3847	PAL-ORANGE	Brix
3848	PAL-TOMATO	Brix
3849	PAL-MAPLE	Brix
Sugar		
4412	PAL-12S	Dextran
4414	PAL-14S	Fructose
4415	PAL-15S	Glucose
4416	PAL-16S	High Fructose Corn syrup (HFCS-42)
4417	PAL-17S	High Fructose Corn syrup (HFCS-55)
4418	PAL-18S	Inverted suger
4419	PAL-19S	Lactose
4420	PAL-20S	Maltose
Wine, Brew		
4479	PAL-79S	T.A. 1990
4480	PAL-80S	T.A. 1971
4483	PAL-83S	KMW (or Babo)
4484	PAL-84S	Baume
4486	PAL-86S	Oe (Ger) / Brix (Dual scale)
4487	PAL-87S	Oe (Oechsle) / Brix (Dual scale)
4590	PAL-Plato	Plato (Sweet wort)
Seawater, Salinity		
4406	PAL-06S	Seawater (Concentration)
4407	PAL-07S	Seawater (S.G.)
4408	PAL-08S	Seawater (Baume)
4403	PAL-03S	Sodium chloride (g/100g)
4506	PAL-106S	Sodium chloride (g/100ml)
4404	PAL-04S	Sodium chloride (S.G.)
4405	PAL-05S	Sodium chloride (Baume)

Cat.No.	Model	Scale
Clinical, Sports		
4442	PAL-42S	Cesium chloride
4453	PAL-53S	Copper sulfate (Concentration)
4454	PAL-54S	Copper sulfate (S.G.)
4410	PAL-10S	Urine (S.G.)
4510	PAL-USG(DOG)	Dog Urine (S.G.)
4511	PAL-USG(CAT)	Cat Urine (S.G.)
4585	PAL-mOsm.	NEW Urine Osmolality
Alcohol liquid		
4433	PAL-33S	NEW Ethyl alcohol (ml/100ml)
4434	PAL-34S	Ethyl alcohol (g/100g)
4436	PAL-36S	Methyl alcohol
4437	PAL-37S	Isopropyl alcohol
4485	PAL-85S	Polyvinyl alcohol
Pharmaceutical reagents		
4412	PAL-12S	Dextran
4413	PAL-13S	Creatine
4423	PAL-23S	Glycerin (Low concentration)
4424	PAL-24S	Glycerin (High concentration)
4425	PAL-25S	Inulin
4426	PAL-26S	Mannitol
4431	PAL-31S	Formic acid
4432	PAL-32S	Phosphoric acid
4451	PAL-51S	Sodium bromide
4455	PAL-55S	Magnesium sulfate
4464	PAL-64S	Sodium bicarbonate
4465	PAL-65S	Sodium tartrate
4466	PAL-66S	Potassium oxalate
4468	PAL-68S	Potassium dichromate
4470	PAL-70S	Potassium phosphate
4472	PAL-72S	Sodium tungstate
Automobile, Aviation, Heat Transfer, Industrial		
4502	PAL-102S	Cutting oil
4518	PAL-Urea	Urea
4403	PAL-03S	Snow-melting agent (Sodium chloride)
4441	PAL-41S	Snow-melting agent (Calcium chloride)
4443	PAL-43S	Snow-melting agent (Magnesium chloride)
4488	PAL-88S	Propylene glycol Freezing point of Propylene glycol (°C)
4489	PAL-89S	Propylene glycol Freezing point of Propylene glycol (°F)
4491	PAL-91S	Ethylene glycol Freezing point of Ethylene glycol (°C)

Cat.No.	Model	Scale
4492	PAL-92S	Ethylene glycol Freezing point of Ethylene glycol (°F)
Automobile, Aviation, Heat Transfer, Industrial		
4440	PAL-40S	Sodium hydroxide
4421	PAL-21S	Dextrin
4438	PAL-38S	Dimethylformamide
4423	PAL-23S	Glycerin (Low concentration)
4424	PAL-24S	Glycerin (High concentration)
4430	PAL-30S	Acetic acid
4431	PAL-31S	Formic acid
4432	PAL-32S	Phosphoric acid
4444	PAL-44S	Lithium chloride
4445	PAL-45S	Barium chloride
4446	PAL-46S	Cobalt chloride
4447	PAL-47S	Ferric chloride
4448	PAL-48S	Strontium chloride
4449	PAL-49S	Potassium chloride
4450	PAL-50S	Potassium bromide
4451	PAL-51S	Sodium bromide
4452	PAL-52S	Potassium iodide
4453	PAL-53S	Copper sulfate (Concentration)
4454	PAL-54S	Copper sulfate (S.G.)
4455	PAL-55S	Magnesium sulfate
4456	PAL-56S	Potassium sulfate
4457	PAL-57S	Nickel sulfate
4458	PAL-58S	Sodium sulfate
4459	PAL-59S	Zinc sulfate
4460	PAL-60S	Silver nitrate
4461	PAL-61S	Sodium nitrate
4462	PAL-62S	Potassium carbonate
4463	PAL-63S	Sodium carbonate
4464	PAL-64S	Sodium bicarbonate
4467	PAL-67S	Potassium chromate
4468	PAL-68S	Potassium dichromate
4469	PAL-69S	Sodium thiosulfate
4470	PAL-70S	Potassium phosphate
4471	PAL-71S	Sodium molybdate
4472	PAL-72S	Sodium tungstate
Soil, Civil engineering		
4571	PAL-Soil	Gravimetric / Volumetric Soil moisture (Dual scale)

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ATAGO® HAND-HELD REFRACTOMETER

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

MASTER Series

Ultimate Functionality. Unsurpassed Quality. Seamless Usability.

1.Water Resistant MASTER-α•H

IP65

The value 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).

2.Visibility

Efficiently using an analog unit depends on how easily the boundary line can be read. Extensive research on the quality of optics was undertaken to produce a bright, high-contrast field of vision with large numbers for easy reading.

3.Hygienic Design

The smooth and easy-to-clean grip eliminates the possibility of food and samples being trapped, resulting in contamination and bacterial growth.

4.Automatic Temperature Compensation (ATC) MASTER-α•H•T

ATC

The newly designed ATC system allows the MASTER series to be used in a range of temperature conditions without the need to manually convert the readings. ATAGO has applied for a patent on the design of the improved ATC system. The MASTER series reads more accurately than other comparable models in the market.

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 one meter high onto an oak platfoam, and withstood pressure changes during air travel.

6.Automatic Sample Distribution (ASD)

ASD

ATAGO has developed a spoon-shaped tip that automatically spreads the sample across the prism. This revolutionary, time-saving feature adds to the user-friendliness of the MASTER series.

Measurement Method

Apply 1-2 drops onto the prism.

Close the daylight plate. Look through the eyepiece.

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

Water Resistant MASTER-α•H

Calibration solutions on Page 51

Digital Bench-top Refractometer
Digital Portable Refractometer (Standard)
Analog Portable Refractometer
pH Meter EC Meter
Soil Moisture Meter
Wine
Acidity Meter
Salt Meter
Digital Portable Refractometer (Special)
In-line/process Refractometer
Analog Bench-top Refractometer
Clinical
Polarimeter
Viscometer

ATAGO® HAND-HELD REFRACTOMETER

MASTER Series

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

<Brix Scale>

Function 4 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	α	T	M	H	53S (NEW)	500 (NEW)
Water resistant	●	—	—	●	●	●
Automatic Temperature Compensation (ATC)	●	●	—	●	●	—
Heat resistant	—	—	—	●	—	●
Milky sample	—	—	—	—	●	—

※MASTER- α・H series : IP65 (except eyepiece)

Body Material 2 types

Metal

Die-cast aluminum
Ideal for a wide range of applications from agriculture and food to industrial and chemical, including high-temperature samples. Resistant to organic solvents.

Option

Small Volume Daylight Plate with Hinge Pin
For metal body model
Part No.RE-2311-58M
For plastic body model
Part No.RE-2391-50M

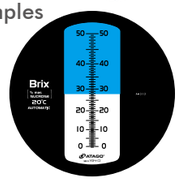
Scale range	α ATC & Water Resistant Refractometer	T ATC Refractometer	M Refractometer	Size and weight
1 Brix 0 to 33% Min.scale 0.2%	MASTER-α Cat.No.2311	MASTER-T Cat.No.2312	MASTER-M Cat.No.2313	3.2×3.4×20.3cm 155g
	Accuracy : Brix ±0.2%	*±0.1% (10 to 30℃) ATC	—	
2 Brix 28 to 62% Min.scale 0.2%	MASTER-2α Cat.No.2321	MASTER-2T Cat.No.2322	MASTER-2M Cat.No.2323	3.2×3.4×20.3cm 155g
	Accuracy : Brix ±0.2%	*±0.1% (10 to 40℃) ATC	—	
3 Brix 58 to 90% Min.scale 0.2%	MASTER-3α Cat.No.2331	MASTER-3T Cat.No.2332	MASTER-3M Cat.No.2333	3.2×3.4×16.8cm 130g
	Accuracy : Brix ±0.2%	*±0.1% (10 to 40℃) ATC	—	
4 Brix 45 to 82% Min.scale 0.2%	MASTER-4α Cat.No.2341	MASTER-4T Cat.No.2342	MASTER-4M Cat.No.2343	3.2×3.4×16.8cm 130g
	Accuracy : Brix ±0.2%	*±0.1% (10 to 40℃) ATC	—	
10 Brix 0 to 10% Min.scale 0.1% Low concentration	MASTER-10α Cat.No.2371	MASTER-10T Cat.No.2372	MASTER-10M Cat.No.2373	3.2×3.4×20.3cm 155g
	Accuracy : Brix ±0.2%	*±0.1% (10 to 30℃) ATC	—	
20 Brix 0 to 20% Min.scale 0.1% Low concentration	MASTER-20α Cat.No.2381	MASTER-20T Cat.No.2382	MASTER-20M Cat.No.2383	3.2×3.4×20.7cm 165g
	Accuracy : Brix ±0.2%	*±0.1% (10 to 30℃) ATC	—	
53 Brix 0 to 53% Min.scale 0.5% Wide range	MASTER-53α Cat.No.2351	MASTER-53T Cat.No.2352	MASTER-53M Cat.No.2353	3.2×3.4×16.8cm 130g
	Accuracy : Brix ±0.5%	*±0.25% (10 to 30℃) ATC	—	

*Repeatability

Calibration solutions on Page 51

Heat Resistant

Brix scale examples



MASTER-50H

MASTER-100H

Range	H ATC & Water Resistant Refractometer	Size and weight
50 Brix 0 to 50% Min.scale 0.5%	MASTER-50H Cat.No.2354	3.2×3.4×16.8cm 130g
	Accuracy : Brix ±0.5% *±0.25% ATC	
80 Brix 30 to 80% Min.scale 0.5%	MASTER-80H Cat.No.2364	
	Accuracy : Brix ±0.5% *±0.25% ATC	
93 Brix 45 to 93% Min.scale 0.5%	MASTER-93H Cat.No.2374	
	Accuracy : Brix ±0.5% *±0.25% ATC	
100 Brix 60 to 100% Min.scale 0.5%	MASTER-100H Cat.No.2384	
	Accuracy : Brix ±0.5% *±0.25% ATC	

*Repeatability

Plastic

P B T
(polybutylene terephthalate)
Resistant to salty and acidic samples.

MASTER-2P α
Example Measuring sauces
Sample information
- About 40% Brix
- Salty
- Oily

Scale: Choose 2 28-62%
Material: Choose the salt-resistant P plastic body. (Metal ··· Blank / Plastic ···· P)
Features: Choose the washable type for easy cleaning. Choose α

Scale range	α ATC & Water Resistant Refractometer	T ATC Refractometer	M Refractometer	Size and weight
1 Brix 0 to 33% Min.scale 0.2%	MASTER-P α Cat.No.2391	MASTER-PT Cat.No.2392	MASTER-PM Cat.No.2393	3.2×3.4×20.3cm 105g
	Accuracy : Brix ±0.2%	*±0.1% (10 to 30℃) ATC	—	
2 Brix 28 to 62% Min.scale 0.2%	MASTER-2P α Cat.No.2941	MASTER-2PT Cat.No.2942	MASTER-2PM Cat.No.2943	3.2×3.4×20.3cm 105g
	Accuracy : Brix ±0.2%	*±0.1% (10 to 40℃) ATC	—	
3 Brix 58 to 90% Min.scale 0.2%	MASTER-3P α Cat.No.2951	MASTER-3PT Cat.No.2952	MASTER-3PM Cat.No.2953	3.2×3.4×16.8cm 90g
	Accuracy : Brix ±0.2%	*±0.1% (10 to 40℃) ATC	—	
4 Brix 45 to 82% Min.scale 0.2%	MASTER-4P α Cat.No.2961	MASTER-4PT Cat.No.2962	MASTER-4PM Cat.No.2963	3.2×3.4×16.8cm 90g
	Accuracy : Brix ±0.2%	*±0.1% (10 to 40℃) ATC	—	
10 Brix 0 to 10% Min.scale 0.1% Low concentration	MASTER-10P α Cat.No.2981	MASTER-10PT Cat.No.2982	MASTER-10PM Cat.No.2983	3.2×3.4×20.3cm 105g
	Accuracy : Brix ±0.2%	*±0.1% (10 to 30℃) ATC	—	
20 Brix 0 to 20% Min.scale 0.1% Low concentration	MASTER-20P α Cat.No.2991	MASTER-20PT Cat.No.2992	MASTER-20PM Cat.No.2993	3.2×3.4×20.7cm 110g
	Accuracy : Brix ±0.2%	*±0.1% (10 to 30℃) ATC	—	
53 Brix 0 to 53% Min.scale 0.5% Wide range	MASTER-53P α Cat.No.2971	MASTER-53PT Cat.No.2972	MASTER-53PM Cat.No.2973	3.2×3.4×16.8cm 90g
	Accuracy : Brix ±0.5%	*±0.25% (10 to 30℃) ATC	—	

*Repeatability

Calibration solutions on Page 51

MASTER Series <Special Scales>

Seawater

Sea Water

α	M
ATC & Water Resistant Seawater Refractometer	Seawater Refractometer
MASTER-S/Mill α Cat.No.2491	MASTER-S/Mill M Cat.No.2493
Accuracy : [1] ±2‰ *±1‰ [2] ±0.001*±0.0005 (10 to 30℃)	———
Range : [1] Salinity 0 to 100‰ Min.scale 1‰ [2] Specific gravity 1.000 to 1.070 Min.scale 0.001	
Size and weight : 3.2×3.4×20.7cm, 110g	

MASTER-S/Mill α

Salinity

High Accuracy NaCl

ATC & Water Resistant Salinity Refractometer	Salinity Refractometer
MASTER-S10 α Cat.No.2471	MASTER-S10M Cat.No.2473
Accuracy : ±0.2g/100g *±0.1g/100g (10 to 30℃)	———
Range : Sodium chloride 0.0 to 10.0g/100g Min.scale 0.1g/100g	
Size and weight : 3.2×3.4×20.3cm, 105g	

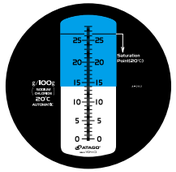
MASTER-S10 α

Salinity

Wide Range NaCl

ATC & Water Resistant Salinity Refractometer	Salinity Refractometer
MASTER-S28 α Cat.No.2481	MASTER-S28M Cat.No.2483
Accuracy : ±0.2g/100g *±0.1g/100g (10 to 30℃)	———
Range : Sodium chloride 0.0 to 28.0g/100g Min.scale 0.2g/100g	
Size and weight : 3.2×3.4×20.3cm, 105g	

*Repeatability



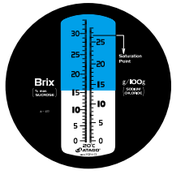
MASTER-S28 α

Brix & Salinity

NEW

Dual Scale

Range		Brix & Salinity Refractometer
[1] Brix	0 to 33%, Min.scale 0.2%	MASTER-BX/S28M Cat.No.2484
[2] Sodium chloride	0 to 28g/100g Min.scale 0.2g/100g	Size and weight : 3.2×3.4×20.3cm, 105g



MASTER-BX/28M

Calibration solutions on Page 51

Milky sample

NEW

Milk

Range		Milky sample Refractometer
Brix 0.0 to 53.0%	Min.scale 0.5%	MASTER-53S Cat.No.2355
		Accuracy : ±0.5% *±0.25%
		Size and weight : 3.2×3.4×16.8cm, 130g

*Repeatability

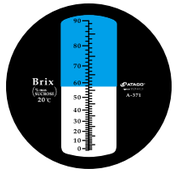
MASTER-53S

Wide Brix range

NEW

Wide Brix

Range		Water Resistant & High Temperature Refractometer
Brix 0.0 to 90.0%	Min.scale 1.0%	MASTER-500 Cat.No.2363
		Size and weight : 3.2×3.4×16.8cm, 130g



MASTER-500

Vegetable & Fruit

NEW

For small-volume measurement

- Optimized for measuring concentrations (Brix) of plant juices from leaves, stems and roots.
- Only a small amount of liquid is needed for measurement.
- Perfectly apt to measure fruit juices and more.

Vegetable

Range		Vegetable & Fruit Refractometer
Brix 0.0 to 53.0%	Min.scale 0.5%	MASTER-AGRI Cat.No.2462
		Size and weight : 3.2×3.4×16.8cm, 130g

● Optional

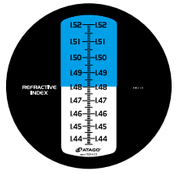
SUPER EXTRACTOR

Part No. RE-29401

Refractive Index

nD Scale

Range		nD Refractometer
Refractive Index (RI) 1.435 to 1.520	Min.scale 0.001	MASTER-RI Cat.No.2612
		Size and weight : 3.2×3.4×16.8cm, 130g

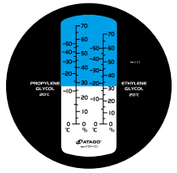


MASTER-RI

Brine

Dual Scale

Range		Coolant Refractometer
[1] Propylene glycol	0 to 70%, Temp 0 to -50℃ Min.scale 5%, 5℃	MASTER-BR Cat.No.2930
[2] Ethylene glycol	0 to 70%, Temp 0 to -50℃ Min.scale 5%, 5℃	Size and weight : 3.2×3.4×16.8cm, 90g



MASTER-BR

Calibration solutions on Page 51

ATAGO® HAND-HELD REFRACTOMETER

<Special Scales>

Battery Coolant

Triple Scale

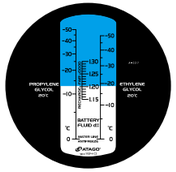
Range
[1] Ethylene glycol freezing temp
[2] Propylene glycol freezing temp
[3] Battery fluid d20/20

	Range	Min.scale
BC	[1] 0 to -50℃	[1] 5℃
	[2] 0 to -50℃	[2] 5℃
	[3] 1.150 to 1.300	[3] 0.01
BCF	[1] 32 to -60°F	[1] 10°F
	[2] 32 to -50°F	[2] 10°F
	[3] 1.150 to 1.300	[3] 0.01

Battery Coolant Refractometer

MASTER-BC/BCF Cat.No.2931 Cat.No.2932

Size and weight : 3.2×3.4×20.3cm, 105g



MASTER-BC/BCF

Honey

NEW

Honey

Range
12.0 to 30.0% (honey moisture)
Min.scale 0.2%

ATC & Water Resistant Honey Refractometer

MASTER-HONEY Cat.No.2522

Size and weight : 3.2×3.2×16.8cm, 90g

MASTER-HONEY

OTHER HAND-HELD REFRACTOMETER

<Brix Scale>

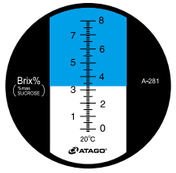
Low Concentration

Range
Brix 0.0 to 8.0%
Min.scale 0.1%

Refractometer

N-8α For Low concentration Cat.No.2360

Size and weight : 4×4×21cm, 260g



N-8α

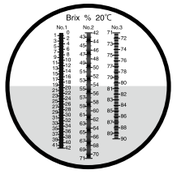
Wide Brix

Range
Brix 0.0 to 90.0% (3steps)
Min.scale 0.2%

Refractometer

HSR-500 Cat.No.2340

Size and weight : 4×4×20cm, 600g



HSR-500

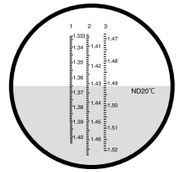
Wide nD

Range
Refractive Index (nD)
1.333 to 1.520 (3steps)
Min.scale 0.001

nD Refractometer

R-5000 Cat.No.2350

Size and weight : 4×4×20cm, 600g



R-5000

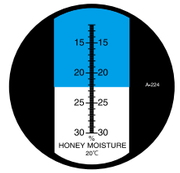
Honey

Range
12.0 to 30.0% (honey moisture)
Min.scale 0.1%

Honey Refractometer

HHR-2N Cat.No.2522

Size and weight : 4×4×17cm, 260g



HHR-2N

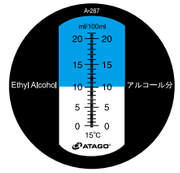
Ethanol

Range
Ethyl Alcohol Concentration
0.0 to 21.0% (/100)
Min.scale 0.2%
Resolution 0.1%

Alcohol Refractometer

AL-21α Cat.No.2361

Size and weight : 4×4×21cm, 260g



AL-21α

NEW

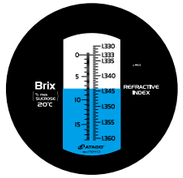
Desk Top

Range
Brix 0.0 to 18.0%
Refractive Index (RI)
1.3300 to 1.3605
Min.scale 0.2%
Min.scale 0.0005%

Desk Top Refractometer

T3-BX/RI Cat.No.2745

Size and weight : 10×17.3×21.5cm, 910g



T3-BX/RI

ATAGO® pH / EC METER

DPH/DEC

Waterproof. Ideal for Outdoor Use!

DPH-2

DEC-2

Measurement Method

1. Press the power button.

2. Dip the electrode into the sample.

3. Measurement value is displayed.

Optional Accessories

Buffer solution for DPH-2

Part No.	Part Name	Contents
RE-99210	<Buffer solution for pH Meter> pH 4.01	Approx. 500mℓ
RE-99212	<Buffer solution for pH Meter> pH 7.00	Approx. 500mℓ
RE-99214	<Buffer solution for pH Meter> pH 10.01	Approx. 500mℓ

Standard solution for DEC-2

Part No.	Part Name	Contents
RE-99205	<Standard solution for EC Meter> 12.9mS/cm	Approx. 500mℓ

Digital pH Meter

DPH-2 Cat.No.4320

Measurement range	0.0 to 14.0pH
Resolution	0.1pH
Measurement accuracy	±0.1pH (2.0 to 12.0pH)
Measurement temperature	0.0 to 50.0℃ (ATC)
Calibration	3 points (4.0, 7.0 and 10.0)
Power supply	4 x watch batteries (LR44)
International protection class	IP67 Water resistant
Dimensions and weight	4.5×3.0×16.3cm, 90g

Digital EC Meter

DEC-2 Cat.No.4340

Measurement range	Conductivity 0.00 to 19.90mS/cm
Resolution	Conductivity 0.10mS/cm (The second decimal place remains '0'.)
Measurement accuracy	Conductivity ±0.20mS/cm (At 0.0 to 10.0mS/cm) ±0.40mS/cm (At 10.10 to 19.90mS/cm)
Measurement temperature	0.0 to 50.0℃ (ATC)
Calibration	0.71g/100g saline solution
Power supply	4 x Watch batteries (LR44)
International protection class	IP67 Water resistant
Dimensions and weight	4.5×3.0×16.3cm, 90g

ATAGO® SOIL MOISTURE METER

PAL-Soil

Save on Time, Labor, and Material.

What is gravimetric soil moisture?

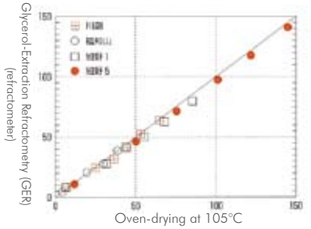
As defined by ISO 16586:2003, soil quality is the water content % of soil expressed by mass (weight). It is the mass of water relative to the mass of oven-dried soil. Soil is dried in an 110℃±5℃ oven.

*This measurement method was developed by Professor Wada at Kyushu University and has proven to have a strong correlation with ISO 16586:2003.

$$w = \frac{Ma-Mb}{Mb} \times 100$$

- w = Gravimetric soil moisture (%)
- Mb = Mass of soil after drying in the oven
- Ma = Mass of soil before drying in the oven
- Ma-Mb = Mass of water in soil

Comparison between refractometers and oven-dry method for determination of gravimetric water content (%) of soil



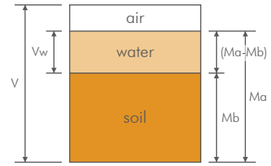
What is volumetric soil moisture?

It is the water content % of soil expressed by volume. It is the volume of water relative to the total volume of a soil sample. A sand-pouring cylinder is commonly used.
The PAL-Soil calculates the water content of soil by measuring a decline in the refractive index of glycerin after it is mixed with water at the 5:3 ratios. It utilizes the water-absorbing properties of glycerin.

$$\theta = \frac{Vw}{V} \times 100$$

- θ = Volumetric soil moisture (%)
- V = Total volume of soil sample
- Vw = Volume of water

Soil Moisture



Construction / Irrigation

A measurement only takes 10 minutes whether out in the fields or in the lab.

Always clean and shiny - can be rinsed under running water.

Pocket Soil Moisture Meter

PAL-Soil Cat.No.4571

Measurement range	Gr : 0 to 200%	Vo : 0 to 100%
Resolution	Gr : 1%	Vo : 1%
Measurement accuracy	Gr : ±2% (0 to 40%), ±5% (41 to 100%)	Vo : (Repeatability) ±1% (0 to 60%), ±2% (61 to 100%)
Measurement temperature	Gr : 10 to 40℃ (ATC)	Vo: 10 to 40℃ (ATC)
Ambient temperature	10 to 40℃	
Power supply	2×AAA Batteries	
International protection class	IP65 Water resistant	
Dimensions and weight	5.5×3.1×10.9cm, 100g	

Gr = Gravimetric soil moisture Vo = Volumetric soil moisture

Wine

- Grape growers
- Wine cooperatives (sorting grape must)
- Wineries (purchasing grape must)
- Buyers for grape must

Refractometers can effectively estimate the alcohol content in finished wine.

Refractometers are used to measure the sugar content of grape must before fermentation. During fermentation, sugars in grape must are converted into alcohol. Pre-fermentation Brix readings are a reliable indicator for the finished alcohol level. Although Brix is a popular sugar scales for winemakers worldwide, there are other scales for measuring grape must. The WM-7 Digital Wine Refractometer is equipped with 7 scales to satisfy the need of end-users in different countries and regions to meet various standards.

Digital Wine Refractometer

WM-7 Cat.No.3415

7 Scales

Scales	Measurement range	Resolution	Measurement accuracy
[1] Brix (determined by ICUMSA)	0.0 to 45.0%	0.1%	±0.1%
[2] T.A. 1990 (Titre Alcoometrique established in 1990)	0.0 to 26.0%	0.1%	±0.2%
[3] T.A.1971 (Titre Alcoometrique established in 1971)	0.0 to 25.0%	0.1%	±0.2%
[4] Oe (GER) (Oechsle used in Germany)	0 to 240°	1°	± 1°
[5] Oe (Oechsle)	0 to 240°	1°	± 1°
[6] KMW (or Babo)	0.0 to 40.0°	0.1°	±0.2°
[7] Baume	0.0 to 21.0°	0.1°	±0.2°
Measurement temperature	5 to 40℃ (ATC)		
Ambient temperature	5 to 40℃		
Measurement time	3 seconds		
Power supply	006P Dry battery (9V)		
International protection class	IP64 Water resistant		
Dimensions and weight	17×9×4cm, 300g		

Digital Hand-held "Pocket" Wine Refractometer

PAL-84S

Dual Scale

PAL-79S Cat.No.4479
PAL-80S Cat.No.4480
PAL-83S Cat.No.4483
PAL-84S Cat.No.4484
PAL-86S Cat.No.4486
PAL-87S Cat.No.4487

Brix Scale Model PAL-1 P.17

Model	Cat.No.	Scale	Measurement range	Resolution	Measurement accuracy
PAL-79S	4479	T.A. 1990	0.0 to 26.0%	0.1%	±0.2%
PAL-80S	4480	T.A. 1971	0.0 to 25.0%	0.1%	±0.2%
PAL-83S	4483	KMW (or Babo)	0.0 to 40.0°	0.1°	±0.2°
PAL-84S	4484	Baume	0.0 to 21.0°	0.1°	±0.2°
PAL-86S (Dual Scale)	4486	Oe (GER)	0 to 240°	1°	±1°
		Brix	0.0 to 53.0%	0.1%	±0.2%
PAL-87S (Dual Scale)	4487	Oe (Oechsle)	0 to 240°	1°	±1°
		Brix	0.0 to 53.0%	0.1%	±0.2%

Measurement temperature	10 to 40℃ (ATC)
Ambient temperature	10 to 40℃
Measurement time	3 seconds
Power supply	2×AAA Batteries
International protection class	IP65 Water resistant
Dimensions and weight	5.5×3.1×10.9cm, 100g

Calibration solutions on Page 51

ATC & Water Resistant Wine Refractometer

MASTER-TA Cat.No.2590
MASTER-OE Cat.No.2591
MASTER-GOE Cat.No.2592
MASTER-KMW Cat.No.2593
MASTER-BAUME Cat.No.2594

IP65 ATC

Material: Metal

Brix Scale Model P.22

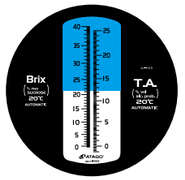
Wine Refractometer

MASTER-P/TA Cat.No.2600
MASTER-P/OE Cat.No.2601
MASTER-P/GOE Cat.No.2602
MASTER-P/KMW Cat.No.2603
MASTER-P/BAUME Cat.No.2604

Material: Plastic

Brix Scale Model P.23

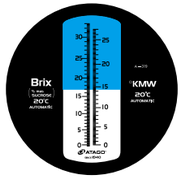
Scale	Model	
T.A.1990 / Brix	MASTER-TA	MASTER-P/TA
Oe (Oechsle) / Brix	MASTER-OE	MASTER-P/OE
Oe (GER) / Brix	MASTER-GOE	MASTER-P/GOE
KMW (or Babo) / Brix	MASTER-KMW	MASTER-P/KMW
Baume / Brix	MASTER-BAUME	MASTER-P/BAUME



MASTER-TA	Model	MASTER-P/TA
2590	Cat.No.	2600
T.A. 0.0 to 25.0 % Brix 0.0 to 40.0 % (ATC)	Scale range	T.A. 0.0 to 25.0 % Brix 0.0 to 40.0 %
T.A. 0.2 % Brix 0.2 %	Minimum scale	T.A. 0.2 % Brix 0.2 %
T.A. ±0.3 % Brix ± 0.5 % (10 to 30℃)	Accuracy	—
3.2×3.4×20.3cm, 155g	Size and weight	3.2×3.4×20.3cm, 105g

MASTER-OE	Model	MASTER-P/OE
2591	Cat.No.	2601
Oe 0.0 to 130° Brix 0.0 to 33.0 % (ATC)	Scale range	Oe 0.0 to 130° Brix 0.0 to 33.0 %
Oechsle 1° Brix 0.2 %	Minimum scale	Oechsle 1° Brix 0.2 %
Oechsle ±1° Brix ±0.2 % (10 to 30℃)	Accuracy	—
3.2×3.4×20.3cm, 155g	Size and weight	3.2×3.4×20.3cm, 105g

MASTER-GOE	Model	MASTER-P/GOE
2592	Cat.No.	2602
German Oechsle 30 to 170° Brix 0.0 to 40.0 % (ATC)	Scale range	German Oechsle 30 to 170° Brix 0.0 to 40.0 %
German Oechsle 1° Brix 0.2%	Minimum scale	German Oechsle 1° Brix 0.2%
German Oechsle ±2° Brix ±0.5 % (10 to 30℃)	Accuracy	—
3.2×3.4×20.3cm, 155g	Size and weight	3.2×3.4×20.3cm, 105g



MASTER-KMW	Model	MASTER-P/KMW
2593	Cat.No.	2603
KMW 0.0 to 27.0° Brix 0.0 to 33.0 % (ATC)	Scale range	KMW 0.0 to 27.0° Brix 0.0 to 33.0 %
KMW 0.2° Brix 0.2 %	Minimum scale	KMW 0.2° Brix 0.2 %
KMW ±0.2° Brix ±0.2 % (10 to 30℃)	Accuracy	—
3.2×3.4×20.3cm, 155g	Size and weight	3.2×3.4×20.3cm, 105g

MASTER-BAUME	Model	MASTER-P/BAUME
2594	Cat.No.	2604
Baume 0.0 to 21.0° Brix 0.0 to 40.0% (ATC)	Scale range	Baume 0.0 to 21.0° Brix 0.0 to 40.0%
Baume 0.2° Brix 0.2%	Minimum scale	Baume 0.2° Brix 0.2%
Baume ±0.3° Brix ±0.5% (10 to 30℃)	Accuracy	—
3.2×3.4×20.3cm, 155g	Size and weight	3.2×3.4×20.3cm, 105g

Calibration solutions on Page 51

PAL-ACID Series

PAL-ACID1 Cat.No.4651

OFF SET

Citric acid
Apples, Tomatoes

Citric acid

Grapefruit	12.8
Pineapple	7.3
Navel orange	6.7
Apple	2.5
Tomato juice	3.3～4.7
Lactic acid drinks	4.1
Ketchup	20.0

Measurement range	Citric acid concentration (total - citrus acidity conversion [g/ℓ]) 1.0 to 40.0 (g/ℓ)
Resolution	0.1 (g/ℓ)
Repeatability	1.0 to 20.0 (g/ℓ) ±0.5 (g/ℓ) 20.1 to 40.0 (g/ℓ) ±1.0 (g/ℓ)

PAL-ACID2 Cat.No.4652

OFF SET

Tartaric acid
Grapes, Wine

Tartaric acid

Grapes（Pione）	6.0
Grapes（Delaware）	5.9
Grapes（Kyoho）	4.7
Red wine（Sangiovese）	5.3
Red wine（Cabernet Sauvignon）	4.9～6.5
White wine（Chardonnay）	5.0～7.3
Grape juice	2.8～5.4

Measurement range	Tartaric acid concentration (total - tartaric acidity conversion [g/ℓ]) 1.0 to 40.0 (g/ℓ)
Resolution	0.1 (g/ℓ)
Repeatability	1.0 to 20.0 (g/ℓ) ±0.5 (g/ℓ) 20.1 to 40.0 (g/ℓ) ±1.0 (g/ℓ)

Measurement Method

1. Pipette 0.1mℓ 100 (μℓ) of the sample and agitate it with the quinone reagent.

2. Fill the sample stage with the mixture, put the metal anti-volatile cover on, and then press the START key.

3. The acid content is displayed in grams per liter.

Compact Design Ideal for Portable Use

NEW PAL-ACID3 Cat.No.4653

OFF SET

Lactic acid
Yoghurt, Lactobacillus drink

Lactic acid

Lactobacillus drink	0.55
Yoghurt drink	0.52

Measurement range	Latcic acid concentration (total - lactic acidity conversion [g/ℓ]) 1.0 to 45.0 (g/ℓ)
Resolution	0.1 (g/ℓ)
Repeatability	1.0 to 20.0 (g/ℓ) ±0.1 (g/ℓ) 20.1 to 45.0 (g/ℓ) ±2.0 (g/ℓ)

NEW PAL-ACID4 Cat.No.4654

OFF SET

Acetic acid
Vineer

Acetic acid

Wine Vineger	1.23
Balsamic Vineger	1.52

※ Quadruple dilution

Measurement range	Acetic acid concentration (total - acetic acidity conversion [g/ℓ]) 1.0 to 25.0 (g/ℓ)
Resolution	0.1 (g/ℓ)
Repeatability	±0.2 (g/ℓ)

Starter Kit

The kit comes complete with 10 bottles of quinone reagent solutions (5mℓ each), a micropipette, 10 micropipette tips, 10 disposable plastic pipettes, 1 bottle of calibration solution, an anti-volatile cover, and 2 AAA batteries.

Consumables

Part No.	Part Name	Contents
RE-79401	Micropipette	
RE-130002	Calibration solution	
RE-99432	Quinone reagent solution	10 pcs
RE-99430	Quinone reagent solution	20 pcs
RE-99431	Quinone reagent solution	50 pcs

One pipette tip per bottle is included.

Common Specifications

Measurement temperature	10 to 40℃ (ATC)
Ambient temperature	10 to 40℃
Standard accessories	・Micropipette : RE-79401 ・Calibration solution : RE-130002 ・Quinone reagent solution 10 pcs : RE-99432
Power supply	2×AAA Batteries
Dimensions and weight	5.5×3.1×10.9cm, 100g

What is Offset Feature? OFF SET

Because of the difference in measurement principles, readings from the PAL-ACID may not match up exactly with readings by titration. However, when a linear correlation exists between readings by the 2 methods, the Offset feature can be used to multiply/subtract/add a fixed value to the PAL-ACID readings so that it displays readings that are in agreement with titration readings.

ATAGO® SALT METER

PAL-ES2&3/ES-421

Eco-friendly and Cost-effective Salinity Measurement.

Why choose ATAGO Salt meter?

1. **Fast** - Results are displayed within 3 seconds.
2. **Easy measurement** - Just press the START key.
3. **Easy calibration**
   - Clean the sensor and press the ZERO key.
4. **Digital display**
   - No more varied readings caused by user interpretation.
5. **Extremely water resistant**
   - The whole unit can be cleaned under running water.*
6. **Automatic Temperature Compensation**
   - Reliable for any samples, hot or cold.

*Applicable only for the PAL-ES2 and PAL-ES3.

The ultra-portable PAL-ES2 and ES3 are perfect for those on the go. Their high performance shines even in a rugged environment, such as a busy kitchen and production line.

Measurement Method

1.Apply 2-3 drops onto the sensor ection.

2.Press the START key.

3.Measurement value is displayed in 3 seconds.

Digital Hand-held "Pocket" Salt Meters (Conductivity Method)

	PAL-ES2 Cat.No.4232	PAL-ES3 Cat.No.4233
Measurement method	Conductivity method	Conductivity method
Measurement range	0.00 to 5.0% (g/100g) of salt concentration	0.0 to 3.3% (g/100ml) salt concentration (Note: User must dilute samples to 10% by weight with distilled water before measuring. Unit will automatically multiply readings by 10 to compensate.)
Measurement accuracy	Displayed value ±0.05% (for salt concentration of 0.00 to 1.00%) Relative precision ±less than 5% (for salt concentration of 1.01 to 5.0%)	Displayed value ±0.6g/100mℓ Relative precision ±less than 6% (for measurement value of 10 to 33.0g/100mℓ)
Resolution	0.01% for salt concentration of 0.00 to 2.99% 0.1% for salt concentration of 3.0 to 5.0%	0.1g/100mℓ
Measurement temperature	10 to 40℃ (ATC)	10 to 40℃ (ATC)
Power supply	2×AAA Batteries	2×AAA Batteries
International protection class	IP65 Water resistant	IP65 Water resistant
Dimensions and weight	5.5×3.1×10.9cm, 100g	5.5×3.1×10.9cm, 100g

Digital Salt Meters (Conductivity Method)

The ES-421 is compact, yet feels substantial and secure on the desk. It serves as a perfect compliment to conventional titration methods, reducing reagent costs and contamination risk.

ES-421 Cat.No.4210

Measurement method	Conductivity method
Measurement range	0.00 to 10.0% (g/100g) of salt concentration
Measurement accuracy	Displayed value±0.05% (for salt concentration of 0.00 to 0.99%) Relative precision ± less than 5% (for salt concentration of 1.00 to 10.0 %) Example1: Solution of salt (3% of salt content) (3.0×±0.05) =±0.15 (measurement precision±0.15%) Example2: Solution of salt (10% of salt content) (10.0×±0.05) =±0.5 (measurement precision±0.5%)
Resolution	0.01% for salt concentration of 0.00 to 2.99% 0.1% for salt concentration of 3.0 to 10.0%
Measurement temperature	10 to 40℃ (ATC)
Power supply	006P Dry battery (9V)
Dimensions and weight	17×9×4cm, 300g

NEW PAL-SALT PROBE

Cat.No.4222

Measurement method	Conductivity method
Measurement range	0.0 to 7.0% (g/100g) of salt concentration
Resolution	0.01% (0.00 to 1.99%) 0.1% (2.0 to 7.0%)
Measurement accuracy	±0.1% (0.00 to 2.0%) Relative precision ±5% (2.1 to 5.0%) Relative precision ±10% (5.1 to 7.0%)
Power supply	2×AAA Batteries
International protection class	IP65 Water resistant
Dimensions and weight	5.5×3.1×10.9cm, 100g(Main unit)

Commonly Measured Food Samples

% (g/100g)

Soup stock, brine

Miso soup	0.9	Soup stock	1.9
Vegetable cooking water	1.0	Brine	2.9
Pasta cooking water	1.0	Ayran	4.9

Sauces

Gravy	0.8	Sushi vinegar	5.2
White sauce	0.9	Noodle dipping sauce	5.8
Demi-glace	1.1	Soy sauce dressing	6.1
Pasta sauce	1.2	Kimuchi paste	6.1
Tomato puree	1.7	Habanero sauce	6.8
Dressing	1.7	Broad bean butter	7.0
Taco sauce	2.0	Oyster sauce	9.4
Steak sauce	2.0	Bean paste	11.0
Ketchup	3.0	Soy sauce	13.0
Savory pancake sauce	4.5	Fish sauce	21.0

Soups

Soup base for hot pot	0.8	Noodle soup	1.4
Minestrone soup	1.2	Tom yam kung	1.5
Potage	1.2	Curry	1.6

Butter, cheese

Butter	0.1	Emmental	1.1
Mozzarella	0.7	Brie	1.8
Gouda	0.9	Gorgonzola	3.6

Meats

Sausage	0.8	Ham	1.1
Salami	1.6	Bacon	1.7
Prosciutto	3.2		

Fish

Sardine	1.0	Salmon	2.4
Salmon roe	2.8	Salted fish viscera	3.2
Anchovy	10.0		

Pickles

Pickle	1.7	Olive	2.8
Sauerkraut	2.1	Pickled radish	3.6
Kimuchi	2.2	Preserved vegetable	14.3

Snacks

Chips	1.4	Crackers	2.3

Optional Accessories

Part No.	Part Name	NaCl Concentration	Contents
RE-120250	2.50% NaCl Solution AB250 (for PAL-ES2, ES3 calibration)	2.50 ±0.05g/100g	Approx.5mℓ
RE-120284	2.84% NaCl Solution AB284 (for ES-421 calibration)	2.84 ±0.05g/100g	Approx.5mℓ

*Shelf life of these solutions is 6 weeks.

ATAGO® DIP-TYPE REFRACTOMETER

PEN-PRO

Dip It Right In. One Step Closer to Maximum Efficiency.

NEW Measurement temperature up to 100℃

- Extremely water resistant (IP65)
- External Light Interference (ELI) → See P.16
- Automatic Temperature Compensation (ATC)
- Calibration with water only
- Measurement in 2 seconds
- Light & compact, 70g
- Quick & easy cleanup!

Continuous Measurement

Use it to stir inhomogenous samples while taking measurements.

Once the START key is pressed, measurements are taken every second.

Water Resistant

Easy and Simple Operation

No need for a pipette or spoon

One-handed operation

Dip and measure multiple batches

Easy cleaning

Digital Hand-held "PEN" Refractometer

PEN-PRO Cat.No. 3730

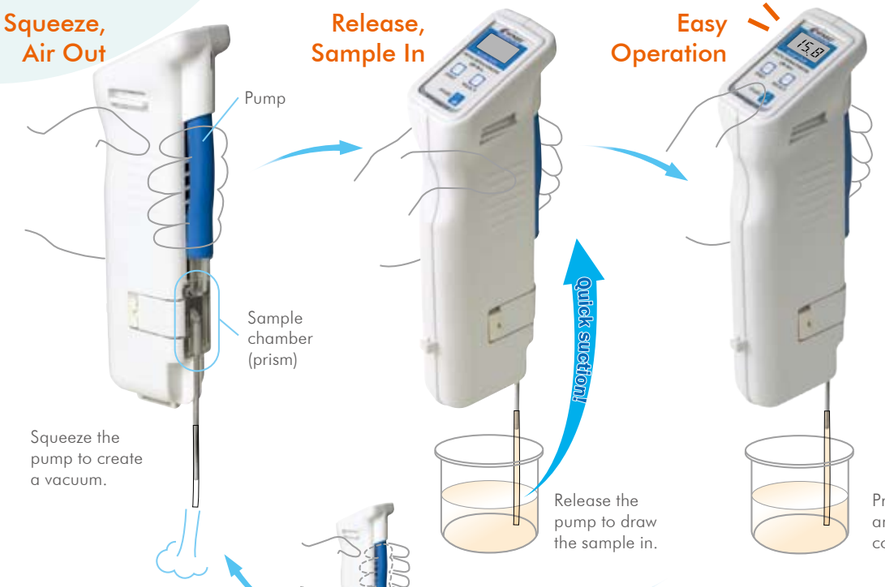
Measurement range	Brix 0.0 to 85.0%
Resolution	Brix 0.1%
Measurement accuracy	Brix ±0.2%
Measurement temperature	10 to 100℃ (ATC)
Ambient temperature	10 to 40℃
Power supply	1×AAA alkaline battery
International Protection class	IP65 Water resistant (Prism head : IP67)
Dimensions and weight	16×3.8×1.8cm, 70g

Calibration solutions on Page 43

ATAGO® SUCTION-TYPE REFRACTOMETER

QR-Brix

Single-handed Operation without Contact.



Face Panel

Squeeze & Release Easy Cleaning

Digital Suction-type Refractometer

QR-Brix Cat.No.3353

Measurement range	Brix 0.0 to 55.0% Temp 5 to 40℃
Resolution	Brix 0.1% Temp 0.1℃
Measurement accuracy	Brix ±0.2 % Temp ±1℃ (with sucrose solution)
Measurement temperature	5 to 40℃ (ATC)
Ambient temperature	5 to 40℃
Power supply	006P Dry battery (9V)
International Protection class	IP64 Water resistant
Dimensions and weight	7×4×21cm (excluding nozzle), 300g The maximum possible length of nozzle : 13cm

Calibration solutions on Page 43

Digital Bench-top Refractometer
Digital Portable Refractometer (Standard)
Analog Portable Refractometer
pH Meter EC Meter
Soil Moisture Meter
Wine
Acidity Meter
Salt Meter
Digital Portable Refractometer (Special)
In-line/process Refractometer
Analog Bench-top Refractometer
Clinical
Polarimeter
Viscometer

ATAGO® DIGITAL REFRACTOMETER

Palette Series

Timeless Quality and Performance. Unfailing Reliability.

- High accuracy (±0.1%) available in a compact model
- 3 user-programmable scales available
- Convenient temperature display
- Automatic Temperature Compensation (ATC)
- External Light Interference (ELI) P.16
- 2-year warranty

<Brix Scale>

Low Concentration

PR-32α Cat.No.3405

Low Concentration

RNG :	Brix 0.0 to 32.0%
ACC :	±0.1%
TMP :	5 to 40℃ (ATC)
RES :	0.1%

0.0 to 32.0% Brix. Suitable for coffee, wort, fresh fruits, metal working fluids, and more.

Low & Middle Concentration

PR-101α Cat.No.3442

No.1 Sales

RNG :	Brix 0.0 to 45.0%
ACC :	±0.1%
TMP :	5 to 40℃ (ATC)
RES :	0.1%

0.0 to 45.0% Brix. Suitable for sauces, soups, jellies, soft drinks, and more.

Wide Range

PR-201α Cat.No.3452

Wide Brix

RNG :	Brix 0.0 to 60.0%
ACC :	±0.1%
TMP :	10 to 40℃ (ATC)
RES :	0.1%

0.0 to 60.0% Brix. Suitable for a wide range of food, beverages, chemicals, and industrial products.

High Concentration

PR-301α Cat.No.3462

High Concentration

RNG :	Brix 45.0 to 90.0%
ACC :	±0.1%
TMP :	10 to 40℃ (ATC)
RES :	0.1%

45.0 to 90.0% Brix. Suitable for syrups, jam, jellies, and more.

Calibration solutions on Page 43

<Special Scales>

Refractive Index

PR-RI Cat.No.3480

nD Scale

RNG :	Refractive Index 1.3306 to 1.4436
ACC :	±0.0002 (Water at 20℃)
TMP :	5 to 45℃
RES :	0.0001

Refractive Index. Suitable for various raw materials and chemicals.

Hydrogen Peroxide

PR-50HO Cat.No.3478

H_2O_2

RNG :	Hydrogen peroxide 0.0 to 50.0% (W/W)
ACC :	±0.5%
TMP :	5 to 40℃ (ATC)
RES :	0.1%

0.0 to 50.0% hydrogen peroxide concentration. Popular disinfectant in the food and dairy industries.

Ethyl Alcohol

PET-109 Cat.No.3486

Ethanol

RNG :	Ethyl alcohol 0.0 to 45.0% (W/W)
ACC :	±0.5% (0 to 30%)
TMP :	10 to 35℃ (ATC)
RES :	0.1%
	※Concentration of about 40% , ±0.8%
	Concentration of about 45% , ±1.2%

0.0 to 45.0% ethanol concentration. Commonly used as a fuel (additive), antiseptic, and solvent.

Ethyl alcohol(v/v)range model is available. Contact ATAGO for more details.

Isopropyl Alcohol

PR-60PA Cat.No.3477

IPA

RNG :	Isopropyl alcohol 0.0 to 60.0% (W/W)
ACC :	±0.5% (0 to 30%)
TMP :	10 to 35℃ (ATC)
RES :	0.1%
	※Concentration of about 40% , ±0.8%
	Concentration of about 60% , ±1.6%

0.0 to 60.0% IPA concentration. Commonly used as a solvent, sanitizer, and preservative in labs.

Dimethylformamide

PR-40DMF Cat.No.3489

DMF

RNG :	Dimethylformamide 0.0 to 40.0% (W/W)
ACC :	±0.3%
TMP :	5 to 40℃ (ATC)
RES :	0.1%

0.0 to 40.0% DMF concentration. Used in the production of plastics, adhesives, fibers, and surface coatings.

Salinity

PR-100SA Cat.No.3488

Sea Water

RNG :	Salinity 0 to 100‰
ACC :	±2‰
TMP :	5 to 40℃ (ATC)
RES :	1‰

Salnity of seawater. An important parameter in aquaculture.

● Reference

RNG	Measurement range
ACC	Measurement accuracy
TMP	Measurement temperature
RES	Resolution

● Common Specifications

Ambient temperature	5 to 40℃
Power supply	006P Dry battery (9V)
International Protection class	IP64 Water resistant
Dimension and weight	17×9×4cm, 300g

Calibration solutions on Page 43

ATAGO® IMMERSION REFRACTOMETER

PAN-1

Never Miss a Change with Real-time Readings.

NEW **No special equipment is needed for the set-up.**

- Metal-working fluids
- Water-based cleaning fluids
- Food

Automatic continuous measurement!

Once START is pressed, the unit continues to take measurements every 30 seconds.

Simply clip the unit on the side of a container or pot!

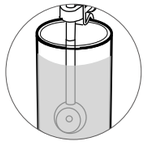
No special equipment is needed for the set-up.

Rugged construction for reliable long-term performance!

The immersed part is made of SUS 316L stainless-steel.

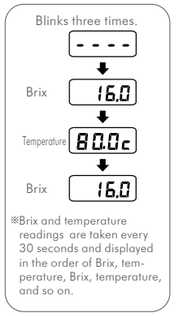
Measurement Method

①Submerge the prism in the liquid.



②Press the Start key.

③Measurements are taken every 30 seconds.



※Brix and temperature readings are taken every 30 seconds and displayed in the order of Brix, temperature, Brix, temperature, and so on.

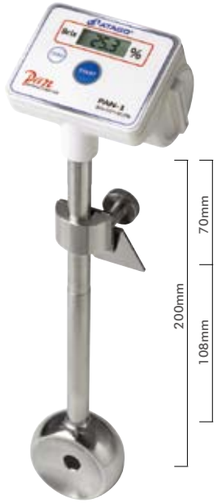
Installation Example

Calibration solutions on Page 51

Digital Immersion Refractometer

PAN-1 Cat.No.3596

Dimensions and weight
8×7.2×30cm, 630g



Digital Immersion Refractometer

PAN-1(M) Cat.No.3597

Dimensions and weight
8×7.2×40cm, 660g

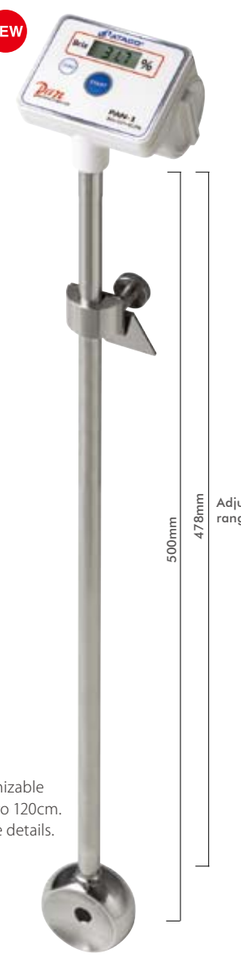
NEW

Digital Immersion Refractometer

PAN-1(L) Cat.No.3598

Dimensions and weight
8×7.2×60cm, 730g

NEW



Choose from 3 Options the Length Best Suited for Your Application.

● Common Specifications

Measurement range	Brix 0.0 to 42.0%　Temp 10.0 to 99.9℃
Resolution	Brix 0.1%　Temp 0.1℃
Measurement accuracy	Brix ±0.2%　Temp ±0.5℃
Measurement temperature	10 to 95℃ (ATC)
International Protection class	IP67 Water resistant (Display : IP65)
Ambient temperature	10 to 45℃
Power supply	1×Size D alkaline battery Compatible with LSD NiMH
Battery life	2 months (when an alkaline battery is used)
Dimensions and weight	8×30×7.2cm, 630g

※The rod length is customizable in 10cm increments up to 120cm. Contact ATAGO for more details.

Calibration solutions on Page 51

Digital Bench-top Refractometer
Digital Portable Refractometer (Standard)
Analog Portable Refractometer
pH Meter EC Meter
Soil Moisture Meter
Wine
Acidity Meter
Salt Meter
Digital Portable Refractometer (Special)
In-line/process Refractometer
Analog Bench-top Refractometer
Clinical
Polarimeter
Viscometer

ATAGO® IN-LINE REFRACTOMETER

CM Series

Simplicity at Its Best. Powerful and Versatile Process Measurement.

In-line Brix Monitor NEW

CM-800α Cat.No.3564

This new addition to the CM series is compatible with the PRM-100α fittings. Fittings are available in a wide variety of shapes and sizes. The accuracy is ±0.1% across the entire range of 0-80% Brix.

	CM-800α Cat.No.3561
Measurement scale	Brix (ATC according to the sample liquid)
Measurement range	Brix 0.0 to 80.0%
Resolution	Brix 0.01 or 0.1 (With an option to display measurements between 0.00 and 9.99% to the 2nd decimal place)
Measurement accuracy	Brix ±0.1%
Measurement temperature	5 to 100℃ (ATC)
Ambient temperature	5 to 40℃
Output method	RS-232C, DC 4 to 20mA
Materials in contact with the solution	Prism : Sapphire Prism stage : SUS316
International Protection class	IP64 Water resistant
Power supply	DC24V
Dimensions and weight	16×17×11cm, 2.4kg

In-line Brix Monitor

CM-780N Cat.No.3561

This simple, economical, and straight-forward model has a wide variety of applications - from cleaning solutions and coolants to food and beverages.

	CM-780N Cat.No.3561
Measurement scale	Brix (ATC according to the sample liquid)
Measurement range	Brix 0.0 to 78.0%
Resolution	Brix 0.1%
Measurement accuracy	Brix ±0.2%
Measurement temperature	5 to 100℃ (ATC)
Ambient temperature	5 to 40℃
Output method	RS-232C, DC 4 to 20mA
Materials in contact with the solution	Prism : Sapphire Prism stage : SUS316
International Protection class	IP64 Water resistant
Power supply	DC24V
Accessory	Power input cable (1m)
Dimensions and weight	16×17×11cm, 1.8kg

Calibration solutions on Page 51

Special Order Options

SUS316L customizable | PROFIBUS connectable | VARIVENT customizable

VARIVENT® is a registered trademark of GEA Tuchenhagen.

In-line Ethylene Glycol Monitor NEW

CM-780N-EG Cat.No.3544

The CM-780N-EG is specially desiged for in-line concentration measurements of ethylene glycol solutions used as coolants, brine, anti-freeze, and de-icing fluids. It also has a secondary scale for the freezing point.

	CM-780N-EG Cat.No.3561
Measurement scale	E.G. (ATC)
Measurement range	E.G. 0.0 to 90.0%, Freezing point 0 to −50℃, Temperature 0 to 99℃
Resolution	E.G. 0.1%, Freezing point 1℃, Temperature 1℃
Measurement accuracy	E.G. ±0.4%, Freezing point ±1℃, Temperature ±1℃
Measurement temperature	5 to 100℃ (ATC)
Ambient temperature	5 to 40℃
Output method	RS-232C, DC 4 to 20mA
Materials in contact with the solution	Prism : Sapphire Prism stage : SUS316
International Protection class	IP64 water resistant
Power supply	DC24V
Accessory	Power input cable (1m)
Dimensions and weight	16×17×11cm, 1.8kg

Optional Accessories

●Fitting Options

Hose connector
12mmϕ

Compression Fitting
10mmϕ

●AC Adapter

AD-32 (AC100V)
AD-33 (AC110-120V)
AD-34 (AC220-240V)

●Stand

Stand for mounting the CM-780N and the AC adapter.

*Contact ATAGO if you are interesting in using the CM series to measure other types of solution.

Calibration solutions on Page 51

In-line Brix Monitor

CM-BASE(A) Cat.No.3593
CM-BASE(D) Cat.No.3594

Easy operation with only one cable for power supply and data output.

	CM-BASE(A)	CM-BASE(D)
Measurement scale	Brix (ATC according to the sample liquid)	
Measurement range	Brix 0.0 to 33.0%	
Resolution	Brix 0.1%	
Measurement accuracy	Brix ±0.5% , Tempreture ±2.0℃	
Measurement temperature	10 to 50℃ (ATC)	
Ambient temperature	10 to 40℃	
Output method	DC 4 to 20mA	RS-232C
International Protection class	IP64 Water resistant	
Dimensions and weight	9×9×5.9cm, 860g	

Optional Accessories

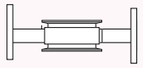
Hose connector
12mmϕ

Compression Fitting
10mmϕ

α series Fitting Options

PRM-100α
CM-800α

Fitting Options

IDF/ISO clamp union (ferrule)	1S 2S 3S	
IDF/ISO screw union (screw)	1S 2S 3S	
JIS Flange	25A 40A 65A	
IDF/ISO clamp union (ferrule)	1S 2S 3S	
IDF/ISO screw union (screw)	1S 2S 3S	
JIS Flange	25A 40A 65A	

● Inner Diameters

1S : 23.0mm
2S : 47.8mm
3S : 72.3mm
25A : 28.4mm
40A : 43.0mm
65A : 70.3mm

Calibration solutions on Page 51

PRM

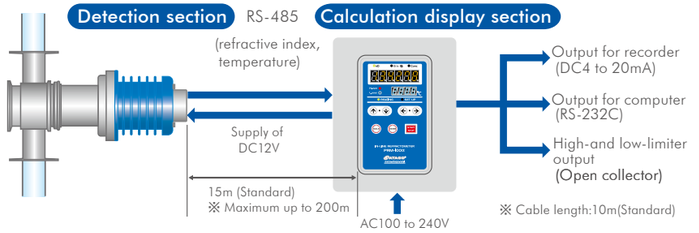
Stay a Step Ahead of Danger with In-line Process Refractometer.

In-line Refractometer

PRM-100α Cat.No.3574

This premium model features lab-grade accuracy across the full range of refractive index, Brix, or user-defined concentration scale. Data can be transmitted to a PLC for system automation.

Example



Measurement range	Refractive Index (nD) 1.32000 to 1.55700, Brix 0.00 to 100.00%
Resolution	Refractive Index (nD) 0.0001 or 0.00001, Brix 0.1% or Brix 0.01% (by selection)
Measurement accuracy	Refractive Index (nD) ±0.00010, Brix±0.05%
Measurement temperature	5 to 100℃ (Clean-in-process (CIP) up to 130℃ for no more than 30 minutes)
Output method	RS-232C, DC4 to 20mA
Alarm output	Open-collector output for high and low limit settings (alarm output)
Materials in contact with the solution	Prism: Sapphire Prism stage: SUS316 O-ring: Kalrez®
Power supply	AC100 to 240V, 50/60Hz
International protection class	Detection section: IP66, Calculation display section: IP65
Dimensions and weight	Detection section: 10.8×26.6×10.8cm, 3.3kg , Calculation display section: 19.2×10×24cm, 3.3kg

Ultrasonic Cleaning Device (Optional)

US-1 Cat.No.9111

ATAGO representatives will advise according to your testing environment.

JIS Flange

Calibration solutions on Page 51

NAR/DR-A1 Series

Standard (Liquid Only)

NAR-1T LIQUID

Cat.No.1211

Refractive Index and Brix of liquid samples.

Standard (Liquid and Solid)

NAR-1T SOLID

Cat.No.1212

Refractive Index and Brix of liquid samples and solid samples, such as film and glass.

High Temperature

NAR-2T

Cat.No.1220

Compatible with a water/oil bath at a temperature as high as 120°C.

	NAR-1T LIQUID Cat.No.1211	NAR-1T SOLID Cat.No.1212	NAR-2T Cat.No.1220
Measurement Range	Refractive Index (nD) 1.3000 to 1.7000 Brix 0.0 to 95.0%	Refractive Index (nD) 1.3000 to 1.7000 Brix 0.0 to 95.0%	Refractive Index (nD) 1.3000 to 1.7000 Brix 0.0 to 95.0%
Minimum scale	Refractive Index (nD) 0.001, Brix 0.5%	Refractive Index (nD) 0.001, Brix 0.5%	Refractive Index (nD) 0.001, Brix 0.5%
Measurement accuracy	Refractive Index (nD) ±0.0002, Brix ±0.1%	Refractive Index (nD) ±0.0002, Brix ±0.1%	Refractive Index (nD) ±0.0002, Brix ±0.1%
Average dispersion value	—	nF-nC (to be calculated according to conversion table)	nF-nC (to be calculated according to conversion table)
Measurement temperature	5 to 50℃	5 to 50℃	5 to 120℃
Thermometer accuracy	±0.2℃	±0.2℃	0 to 100℃…±0.2℃, 100 to 120℃…±0.5℃
Ambient temperature	5 to 40℃	5 to 40℃	5 to 40℃
Power supply	AC100V to 240V, 50/60Hz	AC100V to 240V, 50/60Hz	AC100V to 240V, 50/60Hz
Power consumption	5VA	5VA	5VA
Dimensions and weight	13×18×23cm, 2.5kg (Main unit) 10×11×7cm, 0.5kg (Thermometer)	13×18×23cm, 2.5kg (Main unit) 10×11×7cm, 0.5kg (Thermometer)	12×20×25cm, 5.8kg (Main unit) 10×11×7cm, 0.5kg (Thermometer)

Calibration solutions on Page 51

Original. Irreplaceable. A True Classic.

High Accuracy

NAR-3T

Cat.No.1230

The most accurate of the series, thanks to the larger scale, high intensity lamp, and improved optical systems.

High Refractive Index

NAR-4T

Cat.No.1240

Up to 1.8700 Refractive Index. Polymer samples and more.

	NAR-3T Cat.No.1230	NAR-4T Cat.No.1240
Measurement Range	Refractive Index (nD) 1.30000 to 1.71000 Brix 0.00 to 95.00%	Refractive Index (nD) 1.4700 to 1.8700
Minimum scale	Refractive Index (nD) 0.0002, Brix 0.1%	Refractive Index (nD) 0.001
Measurement accuracy	Refractive Index (nD) ±0.0001, Brix ±0.05%	Refractive Index (nD) ±0.0002
Average dispersion value	nF-nC (to be calculated according to conversion table)	—
Measurement temperature	5 to 50℃	5 to 50℃
Thermometer accuracy	±0.2℃	±0.2℃
Ambient temperature	5 to 40℃	5 to 40℃
Power supply	AC100V to 240V, 50/60Hz	AC100V to 240V, 50/60Hz
Power consumption	5VA	5VA
Dimensions and weight	12×31×34cm, 9.0kg (Main unit) 10×11×7cm, 0.5kg (Thermometer)	13×18×23cm, 2.5kg (Main unit) 10×11×7cm, 0.5kg (Thermometer)

Custom Refractive Index Ranges Available by Special Order

Low Refractive Index

NAR-1T・LO

Cat.No.1217

Measurement Range:
Refractive Index (nD) 1.1500 to 1.4800
Measurement temperature 5 to 50℃

NAR-2T・LO

Cat.No.1227

Measurement Range:
Refractive Index (nD)1.1500 to 1.4800
Measurement temperature 5 to 120℃

High Refractive Index

NAR-2T・HI

Cat.No.1228

Measurement Range:
Refractive Index (nD)1.4700 to 1.8700
Measurement temperature 5 to 120℃

NAR-2T・UH

Cat.No.1229

Measurement Range:
Refractive Index (nD)1.7000 to 2.0800
Measurement temperature 5 to 120℃

Circulating constant temperature bath P.50

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ATAGO® ABBE REFRACTOMETER

Digital Display

DR-A1 Cat.No.1310
DR-A1-Plus Cat.No.1311

DR-A1

DR-A1-Plus

888 Digital

The DR-A1 features numeric displays of measured refractive index or Brix as well as temperature readings. Any potential user error from reading analog scale is eradicated. The DR-A1-Plus features a brighter field of view than its predecessor, the DR-A1, making it easier to measure inhomogeneous and/or dark samples.

Optional printers is : DP-63(C). Circulating constant temperature bath P.50

	DR-A1(-Plus) Cat.No.1310(1311)
Measurement Range	Refractive Index (nD) 1.3000 to 1.7100, Brix 0.0 to 100% (ATC is executed at 5 within 50℃)
Resolution	Refractive Index (nD) 0.0001, Brix 0.1%
Measurement accuracy	Refractive Index (nD) ±0.0002, Brix ±0.1%
Measurement temperature	5 to 50℃
Thermometer accuracy	±0.2℃
Ambient temperature	5 to 40℃
Output	Printer and PC (via RS-232C)
Power supply	AC adapter (100 to 240V (50/60Hz) AC input)
Power consumption	16VA
Dimensions and weight	13×29×31cm, 6.0kg (Main unit) 10.5×17.5×4cm, 0.7kg (AC adapter)

Calibration solutions on Page 51

MULTI-WAVELENGTH

DR-M Series

Multi-wavelength (max.1,100nm)

DR-M2 Cat.No.1410
DR-M4 Cat.No.1414

MAX 1,100 nm

Refractive index and Abbe number measurements are available at any wavelength between 450 and 1,100nm. Either measured refractive index or Abbe number along with the wavelength are displayed on the LCD.
* For measurement at wavelengths above 680nm the optional Near Infrared Ray Viewer is required.

Optional printers is : DP-63(B).
Circulating constant temperature bath P.50

Breaking the D-line Barrier. Endless Possibilities.

Multi-wavelength (max.1,550nm)

DR-M2/1550 Cat.No.1402
DR-M4/1550 Cat.No.1405

MAX 1,550 nm

Refractive index and Abbe number measurements are available at any wavelength between 450 and 1,500nm. Either measured refractive index or Abbe number along with the wavelength are displayed on the LCD.

Optional printers is : DP-63(B).
Circulating constant temperature bath P.50

	DR-M2 Cat.No.1410	DR-M4 Cat.No.1414
Measurement range	Refractive Index 1.3278 to 1.7379 (450nm) 1.3000 to 1.7100 (589nm) 1.2912 to 1.7011 (680nm) 1.2743 to 1.6840 (1,100nm)	Refractive Index 1.5219 to 1.9220 (450nm) 1.4700 to 1.8700 (589nm) 1.4545 to 1.8544 (680nm) 1.4260 to 1.8259 (1,100nm)
Resolution	Refractive Index : 0.0001, Abbe number : 0.1	
Measurement accuracy	Refractive Index : ±0.0002 (With the attached test piece at 500 to 650nm)	
Wavelength range	From 450 to 1100nm (with interference filters) (For measurement at wavelengths ranging from 681 to 1,100nm, the optional Near Infrared Ray Viewer is required)	
Measurement temperature	5 to 50℃	
Output	Printer	
Light source	Halogen lamp	
Power supply	AC100 to 240V 50/60Hz	
Dimensions and weight	13×29×31cm, 6.0kg (Main unit) 15×33×11cm, 3.2kg (Power supply unit)	

	DR-M2/1550 Cat.No.1402	DR-M4/1550 Cat.No.1405
Measurement range	Refractive Index 1.3278 to 1.7379 (450nm) 1.3000 to 1.7100 (589nm) 1.2912 to 1.7011 (680nm) 1.2743 to 1.6840 (1,100nm) 1.2662 to 1.6759 (1,550nm)	Refractive Index 1.5219～1.9155 (450nm) 1.4700～1.8700 (589nm) 1.4561～1.8544 (680nm) 1.4310～1.8259 (1,100nm) 1.4215～1.8136 (1,550nm)
Resolution	Refractive Index : 0.0001, Abbe number : 0.1	
Measurement accuracy	Refractive Index : ±0.0002 (With the attached test piece at 500 to 650nm)	
Wavelength range	From 450 to 1,550nm (with interference filters)	
Measurement temperature	5 to 50℃	
Output	Printer	
Light source	Monochromatic light source device Dimensions, Weight and Power supply 22×30×20 to 30cm, 5.2kg AC200 to 240V, 50/60Hz	
Power supply	AC100 to 240V 50/60Hz	
Dimensions and weight	13×29×31cm, 6.0kg (Main unit) 15×33×11cm, 3.2kg (Power supply unit)	

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.

Calibration solutions on Page 51

Circulating Constant Temperature Bath

60-C4 Cat.No.1922

A circulating water bath for precise temperature control of refractometers without Peltier.

Tank capacity	0.5ℓ
Temperature setting range	10 to 60℃ (water)
Constant-temperature accuracy	±0.2℃
Power consumption	430VA
Power supply	AC 100 to 240V, 50/60Hz
Dimensions and weight	38×24×27cm, 11.0kg

RX series Compatibility with harsh chemicals

The wetted parts can be customized with materials that are resistant to corrosive chemicals, such as acids, bases, and solvents.

Sample stage
- Special coatings (PEEK, PTFE, etc.)
- Custom materials (Corrosion-resistant metal alloys)

Body case
- Special coatings (PEEK, PTFE, etc.)

Cover plate
- Custom materials (PVC resin, fluorine resin, etc.)

Digital Printers


DP-RD


DP-RX


DP-63(A)

		Intended models	Power supply	Power consumption	Dimensions and weight
●Thermal printers					
DP-22	Cat.No.3013	SMART-1 before s/n 092830	DC9V from the refractometer	26VA	14×10×4cm, 390g (main unit only)
DP-RX	Cat.No.3121	RX-α series			
DP-63	Cat.No.3118	RX-i series, DD-7, AP-300,SAC-i	AC adapter (Input voltage : AC100 to 240V)	13VA	17×16×7cm, 580g (main unit only)
DP-63(A)	Cat.No.3134	SMART-1 S/No.092901-			
DP-63(B)	Cat.No.3135	DR-M2, M4, M2/1550, M4/1550 S/No. 092101-			
DP-63(C)	Cat.No.3136	DR-A1, DR-A1-Plus			
●Dot matrix printers					
DP-RD	Cat.No.3122	RX-9000α, 7000α after s/n 051301, RX-5000α after s/n 052601, RX-5000α-Plus, RX-5000 after s/n 080001, RX-5000α-Bev, 007α	AC adapter (Input voltage : AC100 to 240V)	7VA	11×18×9cm, 470g (main unit only)
DP-AD	Cat.No.3123	RX-i series, DD-7, AP-300			

Sucrose Solutions (for Brix confirmation) Standard Liquids Test Pieces

Sucrose Solutions

<Analog Hand-held, PAL, PR-α,NAR, RX series (excluding RX-007α)>

Part No.	Part Name	Contents
RE-110010	10% Sucrose Solution (±0.03%)	Approx.5mℓ
RE-110020	20% Sucrose Solution (±0.03%)	Approx.5mℓ
RE-110030	30% Sucrose Solution (±0.03%)	Approx.5mℓ
RE-110040	40% Sucrose Solution (±0.04%)	Approx.5mℓ
RE-110050	50% Sucrose Solution (±0.05%)	Approx.5mℓ
RE-110060	60% Sucrose Solution (±0.05%)	Approx.5mℓ

*Shelf life for these solutions is 6 weeks.

<High Accuracy (RX series)>

Part No.	Part Name	Contents
RE-111001	10% Sucrose Solution (±0.01%)	Approx.5mℓ
RE-112001	20% Sucrose Solution (±0.01%)	Approx.5mℓ
RE-113001	30% Sucrose Solution (±0.01%)	Approx.5mℓ
RE-114002	40% Sucrose Solution (±0.02%)	Approx.5mℓ
RE-115002	50% Sucrose Solution (±0.02%)	Approx.5mℓ

*Shelf life for these solutions is 10 days.

<Low Accuracy (RX series)>

Part No.	Part Name	Contents
RE-110250	0.25% Sucrose Solution (±0.005%)	Approx.5mℓ
RE-110500	0.50% Sucrose Solution (±0.005%)	Approx.5mℓ
RE-111000	1.00% Sucrose Solution (±0.005%)	Approx.5mℓ

*Shelf life for these solutions is 10 days.

<Low Accuracy (DD-7)>

Part No.	Part Name	Contents
RE-11025D	0.25% Sucrose Solution (±0.005%)	Approx.30mℓ
RE-11050D	0.50% Sucrose Solution (±0.005%)	Approx.30mℓ
RE-11100D	1.00% Sucrose Solution (±0.005%)	Approx.30mℓ

*Shelf life for these solutions is 10 days.

<Request Accuracy>

Custom concentrations are available upon request.
Accuracy and prices will vary by concentration.
Contact ATAGO for more details.

Standerd Liquids

Part No.	Part Name	Contents
RE-99010	Standard Liquid LK (nD 1.473 Brix 73%)	Approx.7mℓ
RE-9324	Standard Liquid LF (nD 1.442 Brix 60%)	Approx.7mℓ
RE-9325	Standard Liquid LG (nD 1.512 Brix 88%)	Approx.7mℓ

*Shelf life for these solutions is 5 years unopened, 2 years opened.

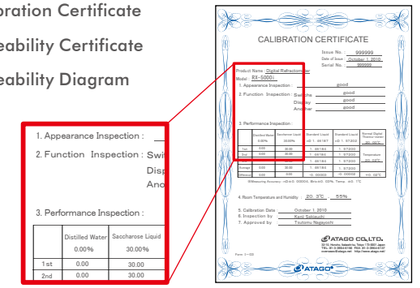
Test Pieces

Part No.	Part Name	Contents
RE-1195	Test Piece A (nD 1.516)	with m-naphthalene 4mℓ
RE-1197	Test Piece C (nD 1.620)	with m-naphthalene 4mℓ

For the utmost in customer satisfaction...

ATAGO offers calibration service in conformance with ISO quality management systems as well as HACCP, GMP, and other standards. The following three documents will be issued. (Calibration service is performed at an additional cost.)

- ●Calibration Certificate
- ●Traceability Certificate
- ●Traceability Diagram



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
D1807	STM for Refractive Index and Specific Optical Dispersion of Electrical Insulating Liquids
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

ATAGO® CLINICAL REFRACTOMETER

Clinical

These refractometers give instant urine specific gravity and serum protein readings.
In medical applications, urine specific gravity is used to test the kidney function, and serum protein level for liver function.
Sports players are commonly tested for urine specific gravity as it is an indication of dehydration.
Though it differs by sports, the tolerance range is generally between 1.015 and 1.020.

Usage Examples

- Clinical labs at hospitals
- Doping tests
- Hydration assessment
- Animal hospitals

Digital Urine Specific Gravity Refractometer

UG-α Cat.No.3464

Drop

Pocket Urine Specific Gravity Refractometer

PAL-10S Cat.No.4410

Drop

Pen Urine Specific Gravity Refractometer

PEN-URINE S.G. Cat.No.3741

Dip

	UG-α Cat.No. 3464	PAL-10S Cat.No. 4410	PEN-URINE Cat.No. 3741
Measurement range	Urine S.G. 1.0000 to 1.0600	Urine S. G. 1.000 to 1.060 Temp 10.0 to 35.0℃	Urine S.G. 1.0000 to 1.0600
Resolution	Urine S.G. 0.0001	Urine S.G. 0.001, Temp 0.1℃	Urine S.G. 0.0001
Measurement accuracy	Urine S.G. ±0.0010	Urine S.G. ±0.001, Temp ±1℃	Urine S.G. ±0.0010
Measurement temperature	10 to 35℃ (ATC)	10 to 35℃ (ATC)	10 to 40℃ (ATC)
Ambient temperature	10 to 35℃	10 to 35℃	10 to 40℃
Power supply	006P Dry battery (9V)	2×AAA Batteries	1×AAA Battery
Dimensions and weight	17×9×4cm, 300g	5.5×3.1×10.9 cm, 100g	16×3.8×1.8cm, 70g

Urine Specific Gravity Measurement with Refractometer

Refractive index of urine is converted into urine specific gravity readings.

Advantages

- Only a small amount of sample is required.
- Measurement only takes a few seconds.
- Automatically compensated for temperature variance.

Conversions from refractive index to urine specific gravity are different for human, dog, and cat urine. Choose the specific model for each.

Pocket Urine Specific Gravity Refractometer

PAL-USG (DOG) Cat.No.4510
Measurement range : Urine S. G. 1.000 to 1.060 *

PAL-USG (CAT) Cat.No.4511
Measurement range : Urine S. G. 1.000 to 1.080 *
* Other specifications are the same as PAL-10S

Serum Protein Concentration & Urine Specific Gravity Desktop Refractometer

T3-NE Cat.No.2754

Triple Scale NEW

Clinical Refractometer

MASTER-SUR/Nα Cat.No.2771
ATC & Water Resistant
MASTER-SUR/NM Cat.No.2773

Triple Scale

Urine Specific Gravity Refractometer

MASTER-URC/Nα Cat.No.2791
ATC & Water Resistant
MASTER-URC/NM Cat.No.2793

Dual Scale

Material : Plastic

	T3-NE Cat.No.2754	MASTER-SUR/Nα Cat.No.2771	/NM Cat.No.2773	MASTER-URC/Nα Cat.No.2791	/NM Cat.No.2793
Measurement range	Urine S.G. 1.000 to 1.050 Serum protein 0.0 to 12.0g/100ml Refractive Index 1.3330 to 1.3600	Urine S.G. 1.000 to 1.060 Serum protein 0.0 to 12.0g/100mℓ Refractive Index (nD) 1.3330 to 1.3660		Urine S.G. 1.000 to 1.050 Refractive Index (nD) 1.333 to 1.356	
Minimum scale	Urine S.G. 0.001 Serum protein 0.2g/100ml Refractive Index 0.0005	Urine S.G. 0.001 Serum protein 0.2g/100mℓ Refractive Index (nD) 0.0005		Urine S.G. 0.001 Refractive Index (nD) 0.001	
Measurement accuracy	—	Urine S.G. ±0.001 Serum protein ±0.2g/100mℓ Refractive Index (nD), ±0.0005 (10 to 30℃)	—	Urine S.G. ± 0.001 Refractive Index (nD) ± 0.0005 (10 to 30℃)	—
International Protection class	—	IP65 Water resistant (except eyepiece)	—	IP65 Water resistant (except eyepiece)	—
Size and weight	10×17.3×21.5cm, 910g	3.2×3.4×20.3cm, 105g		3.2×3.4×20.7cm, 110g	

Digital Bench-top Refractometer | Digital Portable Refractometer (Standard) | Analog Portable Refractometer | pH Meter EC Meter | Soil Moisture Meter | Wine | Acidity Meter | Salt Meter | Digital Portable Refractometer (Special) | In-line/process Refractometer | Analog Bench-top Refractometer | Clinical | Polarimeter | Viscometer

Application of Refractometers

Refractometers generally feature one of the two most common scales - refractive index and Brix.

Use 1 Measuring Refractive Index

Refractive index is one of the physical constants of a substance, and each substance has its own refractive index.
Refractometers are used to measure pharmaceuticals, flavor and fragrance ingredients, chemicals, glass, plastics, etc. for material identification and quality control purposes.

Use 2 Measuring Sugar Concentration

Refractometers can be used to measure Brix values of sugar-rich samples, such as fruit juice, syrup, jam, and honey. The measurement value correlates to the sugar concentration of the sample measured. As described in the "About the Brix (%) Scale" on the following page, Brix is the number of grams of cane sugar dissolved in 100 grams of water. The conversion factor between refractive index and Brix values is determined by the International Commission for Uniform Methods of Sugar Analysis (ICUMSA) .

Use 3 Measuring Concentration of Food Items

Sauces, paste, juice, and other liquid food items have multiple ingredients, such as sugar and salt. Values measured by refractometers are proportional to the total concentration percentage of all dissolved substances. In this case, the Brix value is interpreted as the concentration of the sample, rather than just the sugar content.

Use 4 Measuring Concentration of Other Liquids

Refractometers can be used to determine the concentration of a wide range of liquids including metal-working fluids, pharmaceuticals, cleaning solutions, coolants, and rust inhibitors. A correlation between the concentration of a substance dissolved in water and its Brix value may be observed. By plotting the values of the concentrations and corresponding Brix readings, a user scale can be created. On the other hand, the Brix scale as is, is widely used as a relative measure of dissolved solids.

To save the step of manually converting Brix values to concentrations of various aqueous solutions,
ATAGO offers refractometers that display concentration values directly. Over 80 special scales are available.
ATAGO has studied the correlations between refractive index (Brix) and concentrations of various aqueous solutions for many years in order to create a wide variety of scales to meet our customers' specific needs.

Reference

Refractive Index and Brix of various types of samples.
Please use as a guide when you select a refractometer

RI/Brix	Food Industry	Chemical Industry	Medical science Industry
1.30			Methanol
% 0			
1.333	Green tea Thawing liquid	Cutting oil (emulsion) Cleanser Plant cell culture Grinding chemical liquid Cutting liquid Cleaning liquid	Saline Aloe extract Sea water
	Miso soup Beer		
1.34 5		Nickel plate liquid	
	Japanese plum Strawberry Plain yogurt Lime Lemon Corn soup Coffee	Flatting liquid Medicinal solution	Chlorella extract
10	Orange Mandarin orange Soy milk Coke Apple Milk Alcohol Prince melon Egg white Beef curry Orange jelly Demiglace (sauce) Lactic acid bacteria beverage Nectar	Gelatin liquid Paper starch Freon113 Electric [electrical] Discharging liquid Silicone solution (emulsion)	Serum Acetone Ethanol
1.35			
15			
1.36			
20	Canned seasoning Yogurt Pudding Ice block syrup Canned syrup Starch paste Chili sauce	Protein liquid Electrolyte Freon11	Acetic acid Saturated saline
1.37 25			
1.38 30	Ketchup Soy sauce Sauce	Acrylonitrile	
1.39			
1.40 40	Pastry cream Egg yolk Bean jam Soybean paste Concentrated juice Coconut oil	Silicone oil Ethylene glycol Propylene glycol	Octane
50			
60	Butter Condensed milk Jelly Marmalade Olive oil Molasses Canola oil Sesame oil Cooking oil Honey Starch Syrup	Kerosene Quartz glass Vinyl acetate Diesel oil Ricinus Bunker A	Opal Carbon tetrachloride Glycerin
70			
80			
1.50		Polypropylene (PP) Toluene	Xylene
90		Polyvinyl chloride (PCV)	
	Clove oil	Natural rubber (NR) Styrene Bunker C Quartz Polystyrene (PS)	Crystalline Quartz Glass Rock salt Carbolic acid
1.60		Polycarbonate (PC)	Aniline
	Cinnamon oil	Epoxy (EP) Flint glass Asphalt	Topaz Monobromo-naphthalene
1.70			Methylene Iodide

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 dissolved solids in the sample. In some cases, converting Brix readings to weight or volume percentage concentration may be required.

Relation between Brix value (%) and refractive index (nD)

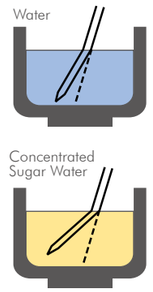
%	n_D^{20}	%	n_D^{20}	%	n_D^{20}
0	1.33299	34	1.3884	68	1.46061
1	1.33442	35	1.3903	69	1.46303
2	1.33586	36	1.3922	70	1.46546
3	1.33732	37	1.3940	71	1.46790
4	1.33879	38	1.3960	72	1.47037
5	1.34026	39	1.3979	73	1.47285
6	1.34175	40	1.3998	74	1.47535
7	1.34325	41	1.4018	75	1.47787
8	1.34477	42	1.4037	76	1.48040
9	1.34629	43	1.4057	77	1.48295
10	1.34782	44	1.4077	78	1.48552
11	1.34937	45	1.4097	79	1.48811
12	1.35093	46	1.4118	80	1.49071
13	1.35250	47	1.4138	81	1.49333
14	1.35408	48	1.4159	82	1.49597
15	1.35568	49	1.4179	83	1.49862
16	1.35729	50	1.4200	84	1.50129
17	1.35891	51	1.42220	85	1.50398
18	1.36054	52	1.42432	86	1.5067
19	1.36218	53	1.42647	87	1.5094
20	1.36384	54	1.42863	88	1.5122
21	1.36551	55	1.43080	89	1.5149
22	1.36720	56	1.43299	90	1.5177
23	1.36889	57	1.43520	91	1.5205
24	1.37060	58	1.43743	92	1.5234
25	1.37233	59	1.43967	93	1.5262
26	1.37406	60	1.44193	94	1.5291
27	1.37582	61	1.44420	95	1.5320
28	1.37758	62	1.44650		
29	1.37936	63	1.44881		
30	1.38115	64	1.45113		
31	1.38296	65	1.45348		
32	1.38478	66	1.45584		
33	1.38661	67	1.45822		

※Refractive index values for Brix 0 to 85% in the above table have been officially determined by ICUMSA (International Committee of Uniform Method of Sugar Analysis held in 1974) .

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 refraction of light. 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.



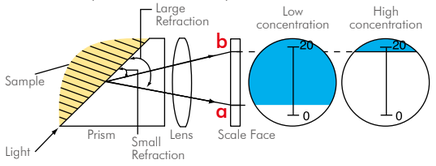
Principles of Refractometers

There are two detection systems for refractive index: transparent systems and reflection systems. Hand-held refractometers and Abbe refractometers use transparent systems, while digital refractometers use reflection systems.

Transparent System of Analog Refractometers

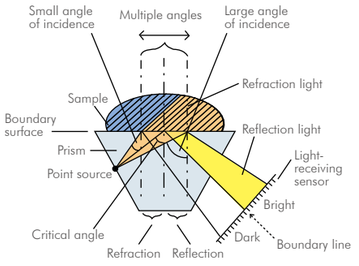
The detection system for hand-held refractometers (transparent system) is summarized below.

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 low in concentration, 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 high in concentration, the angle of refraction is small (see line "b") because of the small difference in refractive index between the prism and the sample.



Reflection System of Digital Refractometers

Light emitted at an angle from a point source underneath the prism toward the sample liquid enters the boundary surface at multiple angles. Depending on the refractive index of the sample, light may be transmitted (refracted) or reflected. For example, water has a low refractive index, and therefore, light is refracted at a small angle of incidence. Likewise, light traveling through a sample of high refractive index is refracted at a large angle of incidence. Refractive index is proportional to critical angle, the largest angle of incidence for which refraction can still occur before incident light is totally reflected. A boundary line separating light and dark fields appears at critical angle. The location of this boundary line is detected by the light-receiving sensor, and refractive index is calculated.



ATAGO® POLARIMETER/SACCHARIMETER

SAC-i

High Performance Sugar Analysis, Now Easier Than Ever.

AUTOMATIC POLARIMETER/SACCHARIMETER

SAC-i NEW

Cat.No.5951

- FDA 21 CFR Part 11 Software Included in Standerd Delivery.

- Measurement stability in 12 seconds (4 seconds in the high-speed & consecutive measurement mode)
- Resolution of up to 3 decimal places
- Repeatability of ±0.003° Angle of Rotation and ±0.009°Z
- Up to 999 automatic consecutive measurements followed by average value display
- Sleep & timer feature to take measurement later at specified time
- Improved usability with the use of touch screen technology
- Connectivity to RX Digital Refractometers for automatic purity measurement

Touch Screen

● Observation tube

Home screen

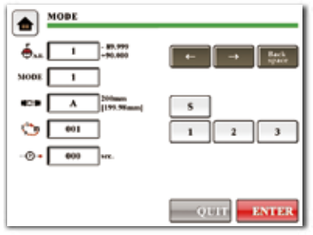
Choose from a total of 6 options – 3 graphic themes, each with 2 background options.

Measurement screen with setting sub-window (lower left)

Basic settings are easily accessible from a sub-window within the main measurement screen. With a touch on the screen, it can switch to display the last 10 measurement history.

Sale edit screen

Edit and save your own scales with ease.



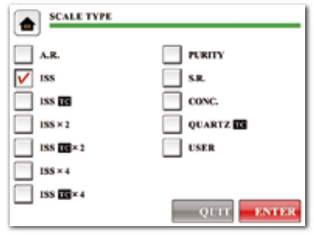
Measurement mode screen

MODE-1: Standard Speed & Manual
A measurement is displayed in approximately 12 seconds.

MODE-2: Standard Speed & Automatic
Measurements are taken consecutively every 12 seconds.

MODE-3: High Speed & Automatic
The first mesurement is taken in approximately 12 seconds, and second and onward measurements approximately every 4 seconds.

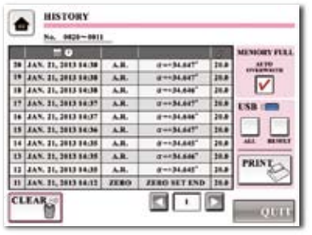
MODE-S: Stability Analysis
Displays the measurement value once a certain level of sample stability is achieved.



Scale select screen

- INTERNATIONAL SUGAR SCALE
- INTERNATIONAL SUGAR SCALE (with ATC)
- PURITY
- ANGLE OF ROTATION
- SPECIFIC ROTATION
- CONCENTRATION

etc.



History screen

Up to 5,000 each of measurement and zero-setting / calibration data can be stored.

	SAC-i Cat.No.5951
Measurement scale	Angle of Rotation, International Sugar Scale (without temperature compensation), International Sugar Scale (with Automatic Temperature Compensation), Specific Rotation, Concentration, Purity, and Angle of Rotation (Temperature Compensation of Quartz Plate)
Measurement range	Angle of Rotation -89.999 to +90.000° or -360 to +360° International Sugar Scale -259 to +259° Z
Resolution	Angle of Rotation 0.001° International Sugar Scale 0.001° Z
Measurement accuracy	Angle of Rotation Displayed value ±0.005° (-45 to +45°) International Sugar Scale Displayed value ±0.015° Z (-130 to +130° Z) (With a Standard Quartz Plate)
Repeatability	±0.003° Angle of Rotation and ±0.009° Z
Sensitivity	up to OD2*
Temperature compensation range for International Sugar Scale	10 to 40℃
Display panel	7.5 inch color LCD (touch screen)
Measurement wavelength	589nm (D-line)
Output	Digital Printer DP-63 or DP-AD (sold separately), USB flash drive and PC - USB
Observation tube included	Observation tubes (100mm【5mℓ】, 200mm【10mℓ】)
Power supply	AC100 to 240V, 50/60Hz
Dimensions and weight	60×36.5×21cm, 20.0kg

*OD = optical density: a measureof light absorbance.
OD2 = 1/100 attenuation and 1% transmission.

Optional Accessories

Observation tube

RE-72072 : 50mm long OT-50
RE-72070 : 100mm long OT-100
RE-72071 : 200mm long OT-200

Jacketed flow tube with funnel

RE-72113 : 100mm
RE-72114 : 200mm

Unjacketed flow tube with funnel

RE-72037 : 100mm
RE-72038 : 200mm

Unjacketed small volume observationtube

RE-72042 : 10mm long

Quartz Control Plate

RE-72043 : 8°(25°Z)
RE-72044 : 17°(50°Z)
RE-72045 : 34°(100°Z)
RE-72048 : –8° (–25°Z)
RE-72049 : –17° (–50°Z)
RE-72050 : –34° (–100°Z)

Jacketed flow tube with funnel

Quartz Control Plate

Optional printer are : DP-63 and DP-AD
Circulating constant temperature bath P.50

POL-½ NEW

Powerful Performance
Comes in Small Packages.

Automatic Compact Polarimeter

POL-½ Cat.No.5271

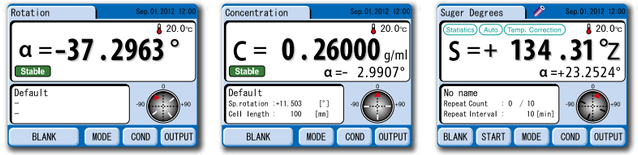
NEW **FDA 21 CFR Part 11 Software Included in Standerd Delivery.**

- **Looks can be deceiving.**
  Though it is half the size of a traditional polarimeter, the POL- ½ provides better resolution than most.
- **There is no time to waste.**
  The response time is 60° per second. That is 15 times faster than before.
- **It cannot be easier.**
  The LCD touchscreen color display makes all operations fast and easy. Data transfer is simple with the use of a USB flash drive. The sample temperature is measured directly and accurately.
- **Always aim high.**
  With new optical technology, the world's highest class resolution of 1/10000° has been achieved.
- **Get validated. Stay compliant.**
  We provide Installation Operational Performance Qualification (IQ/OQ) documentation and support to ensure compliance with all appropriate regulations.

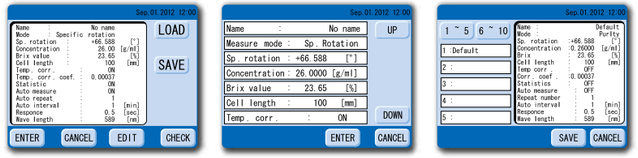
POL-1/2 Optional printer is DP-AD24
Circulating constant temperature bath P.50

The color LCD touchscreen delivers quick and smooth operations.

● Measurement result screens



● Settings and data input screens



Automatic Compact Polarimeter

POL-½ with Peltier temperature control

Cat.No.5272

This Peltier temperature control unit does not require the use of water.
Enjoy stress-free temperature control without worrying about a water leak or cleaning.

POL-½

Measurement item	Angle of rotation, specific rotation, International Sugar Scale, concentration, purity
Measurement range	±90° angle of rotation
Resolution	0.0001°
Accuracy	±0.002° of displayed value (less than 1°), relative precision of ±0.2% (greater than or equal to 1°)
Temperature range	0.0 to 99.9℃
Display	5.7-inch color LCD, Touchscreen
Light source	589nm, LED
Data storage	Printer (sold separately), USB flash drive
Power supply	AC100V to AC240V, (50/60Hz)
Power consumption	100VA
Dimensions & Weight	49 x 25 x 200 cm, 13kg

Peltier temperature control unit

Temperature control method	Auto-tuning PID temperature controller
Temperature range	15℃ to 35℃
Control accuracy	±0.1℃ (resistance thermometer)
Display accuracy	0.1℃
Resolution	0.1℃
Ambient temperature range	0 to 40℃
Ambient humidity range	Less than 90% RH, no condensation
Safety features	Fuse (interrupts excessive current), buzzer alarm
Power supply	AC100V to AC240V, (50/60Hz)
Power consumption	150VA
Dimensions* & Weight	15 x 21.6 x 10.5 cm, 2.5kg

* Rubber feet, terminal blocks, and any other protuberances are excluded.

Options

Cells

Part No.	Product Name	Detail
RE-86010	Square type cell holder	For square cell, without cell lid, applicable for circulated water at constant temperature (same as standard supplied holder)
RE-82100	Square cell 100	Optical path length 100 mm, sample amount 12 mL, without cell lid (spare)
RE-82101	Square cell 50	Optical path length 50 mm, sample amount 6 mL, without cell lid
RE-82102	Square cell 20	Optical path length 20 mm, sample amount 2.4 mL, without cell lid
RE-82103	Square cell 10	Optical path length 10 mm, sample amount 1.2 mL, without cell lid
RE-82106	Jacket cell A1	Optical path length 100mm, sample amount 6.4mL, V-type cell holder required
RE-82107	Jacket cell A3	Optical path length 20mm, sample amount 1.3mL, V-type cell holder required
RE-82108	Jacket cell B1	Optical path length 100mm, sample amount 2mL, V-type cell holder required
RE-82109	Jacket cell C1	Optical path length 100mm, sample amount 1mL, V-type cell holder required
RE-82110	Jacket cell C2	Optical path length 50mm, sample amount 0.5mL, V-type cell holder required
RE-82111	Jacket cell C3	Optical path length 20mm, sample amount 0.2mL, V-type cell holder required
RE-82112	Jacket cell C4	Optical path length 10mm, sample amount 0.1mL, V-type cell holder required
Cat.No.3133	DP-AD24	Plain paper printer - Connection cable included (0.75m)
RE-89403	Standard roll paper	4 rolls in a set
RE-86012	TCS-1	Peltier temperature control unit

ATAGO® POLARIMETER/SACCHARIMETER

AP/POLAX

Quality Instruments within Reach.

NEW FDA 21 CFR Part 11 Software Included in Standerd Delivery.

- Easy To use : Simply place an observation tube in the sample chamber and press START key
- Conforms with ICUMSA standards
- Competitive pricing
- Compact and space-saving

NEW Display average value!

NEW Password protection!

Automatic Polarimeter

AP-300 Cat.No.5291

Measurement readings	Angle of Rotation, International Sugar Scale (without temperature compensation), International Sugar Scale (with Automatic Temperature Compensation), Specific Rotation, Concentration, and Purity
Measurement range	Angle of Rotation -89.99 to +89.99° International Sugar Scale -130.00 to +130.00°Z
Resolution	Angle of Rotation 0.01° International Sugar Scale 0.01°Z
Measurement accuracy	Angle of Rotation Displayed value ±0.01° (-35.00 to +35.00°) Relative precision ±0.2% (-35.01 to -89.99°, +35.01 to + 89.99°) International Sugar Scale Displayed value ±0.03°Z (-101.00 to +101.00°Z) Relative precision ±0.2% (-130.00 to -101.01°Z, +101.01 to +130.00°Z) (Checked by reading a standard Quartz Plate)
Temperature compensation range for international sugar scale	18.0 to 30.0℃
Display panel	Backlit Color LCD
Additional features	(1) Average Measurement Value (2) Password Function
Manual calibration	Enables manual calibration by measuring a standard quartz plate
Measurement wavelength	589nm (D-line)
Output	Printer and PC (via RS-232C)
Light source	Halogen lamp
Accessories	Observation tubes (100mm【5mℓ】, 200mm【10mℓ】)
Power supply	AC100 to 240V, 50/60Hz
Dimensions and weight	48.5×28.5×17.5cm,14.4kg

AP-300 Optional printers are DP-63 and DP-AD
Circulating constant temperature bath P.50

Special Packages

Recommended for sugar industry

Type A - Temperature Control Cat.No.5296

- AP-300 (including accessories)
- Jacketed flow tube with funnel and temperature sensor forjacket (200mm-approximate volume15mℓ)

Circulating Constant Temperature Bath 60-C4 (Cat.No.1922) sold separately

Type B - No Temperature Control Cat.No.5297

- AP-300 (including accessories)
- Unjacketed flow tube with funnel (200mm-approximate volume 15mℓ)

Recommended for pharmaceutical industry

Type C - Temperature Control Cat.No.5294

- AP-300 (including accessories)
- Jacketed flow tube (100mm)
- Inner Lid (for 100mm tube)
- Quartz Control Plate (8°, 17°, or 34°)
- Digital printer DP-AD
- Printer paper for DP-AD
- Ribbon cassette for DP-AD
- Circulating Constant Temperature Bath 60-C4 (Cat.No.1922)

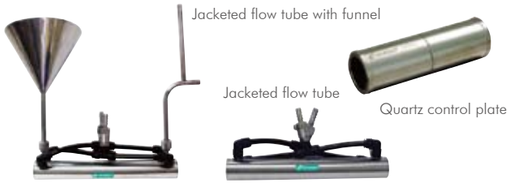
Type D - No Temperature Control Cat.No.5295

- AP-300 (including accessories)
- Quartz Control Plate (8°, 17°, or 34°)
- Digital printer DP-AD
- Printer paper for DP-AD
- Ribbon cassette for DP-AD

Options other than above mentioned 4 types are available.
Contact your nearest ATAGO representative for details.

Optional Accessories

Part No.	Contents	Part No.	Contents
Jacketed flow tube		**Unjacketed flow tube with funnel**	
RE-72036	50mm	RE-72037	100mm
RE-72034	100mm	RE-72038	200mm
RE-72035	200mm		
Jacketed flow tube with funnel		**Unjacketed small volume tube**	
RE-72033	100mm	RE-72042	10mm
RE-72032	200mm		
Quartz control plate			
RE-72043	8° (25°Z)	RE-72048	-8° (-25°Z)
RE-72044	17° (50°Z)	RE-72049	-17° (-50°Z)
RE-72045	34° (100°Z)	RE-72050	-34° (-100°Z)



Semi-automatic Polarimeter

POLAX-2L Cat.No.5223

Measurement range	Angle of rotation -179.95° to +180.00° International Sugar Scale -130.00°Z to +130.00°Z
Resolution	0.05° (0.1°Z)
Measurement accuracy	Angle of rotation ±0.10°
Light source	LED with interference filter (589nm)
Accessories	Observation tubes (100mm【5mℓ】, 200mm【10mℓ】)
Operation switches	Rotates the analyzer slowly to the right (in the slow mode)
R(+)=Right rotation	Rotates the analyzer slowly to the left (in the slow mode)
L(−)=Left rotation	Pressing this switch simultaneously
⬧Temp=Shift/Temp switch	with either (+) switch or the (−) s witch will provide a faster rotation (in the shift mode)
Power supply	AC100 to 240V, 50/60Hz
Dimensions and weight	43×22×30cm, 11.5kg

Application of Polarimeters

Polarimeters generally feature two scales Angle of Rotation and International Sugar Scale.

Use 1 Angle of Rotation versus Specific Rotation

The specific rotation of pharmaceutical, fragrance, and chemical materials is required to determine quality and ensure product safety. A polarimeter is used to measure the angle of rotation, or the optical activity, of the sample after it has been diluted in water. Specific rotation, the intrinsic property of a material at a given temperature and wavelength, is then calculated by the length of the observation tube, the angle of rotation, and the concentration. Generally speaking, specific rotation will be the documented measurement value. As it is easy to confuse specific rotation and angle of rotation, understanding the difference between them is recommended.

Use 2 International Sugar Scale Measurements

The International Sugar Scale is used in sugar processing to determine the purity in raw sugar. Use the "International Sugar Scale" setting on the polarimeter, and measure the sample.

ATAGO® VISCOMETER

BASE/BASE Plus Series NEW

Introducing ATAGO Viscometers.

BASE L	Cat.No.6700
BASE R	Cat.No.6710
BASE H	Cat.No.6720

BASE Plus L	Cat.No.6701
BASE Plus R	Cat.No.6711
BASE Plus H	Cat.No.6721
Thermometer ※optional	RE-89416

No frills digital

Enhanced usability with PC connectivity

BASE

Measurement range (mPa・s)	L : 20 to 2,000,000 R : 100 to 13,000,000 H : 200 to 106,000,000
Speed	0.3 - 100 rpm, Number of speeds : 18

BASE Plus

Measurement range (mPa・s)	L : 20 to 2,000,000 R : 100 to 13,000,000 H : 200 to 106,000,000
Speed	0.3 - 100 rpm, Number of speeds : 18
Thermometer	Optional
Interface	USB
PC Software	Datalogger (to excel)
Auotmatic stop	Torque, time

● Common Specifications

Measurement accuracy	±2% (Full scale)
Measurement resolution	less than 10.000 mPa・s : 0.1, more than 10.000 mPa・s : 1, Using low viscosty sample adaptor (optional): 0.01,
Spindles	Model L : L1-4, Model R and H : R2-7
Dimensions and weight	31×31.8×39.5 to 53cm (adjustable), 3.4kg (Main unit)

PRO/PRO Graphic Series NEW

Debuting 12 New Models.

PRO L	Cat.No.6702
PRO R	Cat.No.6712
PRO H	Cat.No.6722

PRO Graphic L	Cat.No.6703
PRO Graphic R	Cat.No.6713
PRO Graphic H	Cat.No.6723
ATAGOsoft ※optional	Cat.No.6740

Qualified for use in R&D labs as well as for daily QC

Top of the line functionality

PRO

Measurement range (mPa・s)	L : 20 to 6,000,000 R : 100 to 40,000,000 H : 200 to 106,000,000
Speed	0.01 - 200 rpm, Number of speeds : 54
Thermometer	Included
Interface	USB
PC Software	Datalogger (to excel)
Auotmatic stop	Torque, time
Program setup	Possible (Multistep, Ramp)

PRO Graphic

Measurement range (mPa・s)	L : 20 to 6,000,000 R : 100 to 40,000,000 H : 200 to 106,000,000
Speed	0.01 - 250 rpm, Number of speeds : 2600
Thermometer	Included
Interface	USB
PC Software	Datalogger (to excel) , ATAGOsoft(optional)
Auotmatic stop	Torque, time
Program setup	Possible (Multistep, Ramp)
Graph	Can be displayed on the front panel display