# Want Bluetooth® on the PAL that you buy?

Contact Atago for more information

## Digital Hand-Held "Pocket" Refractometer PAL Special Scales

| Cat.No. | Model | Scale |
|---|---|---|
| **Food, Confectionery, Food Ingredients** | | |
| 4422 | PAL-22S | Honey moisture |
| 4508 | PAL-Pâtissier | Brix / Baume (Dual scale) |
| 3807 | PAL-MILK | NEW Non-Fat Milk Solids |
| 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 |
| 4523 | PAL-COFFEE | Brix |
| 4532 | PAL-COFFEE (TDS) | TDS |
| 4533 | PAL-COFFEE (BX/TDS) | Brix / TDS (Dual scale) |
| 4535 | PAL-Tea | Tea |
| **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) |
| 4540 | PAL-Whiskey | Ethyl alcohol |
| 4541 | PAL-Vodka | Ethyl alcohol |
| 4542 | PAL-Tequila | Ethyl alcohol |
| 4543 | PAL-Shochu | Ethyl alcohol |
| 4544 | PAL-Gin | Ethyl alcohol |
| 4545 | PAL-Rum | Ethyl alcohol |
| 4546 | PAL-Brandy | Ethyl alcohol |
| 4590 | PAL-Plato | Plato (Sweet wort) |
| **Salinity, Seawater** | | |
| 4403 | PAL-03S | Sodium chloride (g/100g) |
| 4393 | PAL-03CS | Sodium chloride (g/100g) / Freezing point of Sodium chloride (°C) (Dual scale) |
| 4506 | PAL-106S | Sodium chloride (g/100mL) |
| 4404 | PAL-04S | Sodium chloride (S.G.) |
| 4405 | PAL-05S | Sodium chloride (Baume) |
| 4406 | PAL-06S | Seawater (Concentration) |
| 4407 | PAL-07S | Seawater (S.G.) |
| 4408 | PAL-08S | Seawater (Baume) |
| **Moisture** | | |
| 4573 | PAL-Moisture | Moisture |
| 4574 | PAL-Dried Fruit Moisture | Moisture |
| 4575 | PAL-Dates Moisture | Moisture |
| **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.) |
| 4585 | PAL-mOsm. | Urine Osmolality |
| 4401 | PAL-11S | Serum protein |
| 4510 | PAL-USG (DOG) | Dog Urine (S.G.) |
| 4511 | PAL-USG (CAT) | Cat Urine (S.G.) |
| 4512 | PAL-RABBIT | Rabbit Urine (S.G.) |
| **Colostrum** | | |
| 3805 | PAL-Colostrum | Colostrum |
| **Alcohol liquid** | | |
| 4433 | PAL-33S | Ethyl alcohol (mL/100mL) |
| 4434 | PAL-34S | Ethyl alcohol (g/100g) |
| 4436 | PAL-36S | Methyl alcohol |
| 4437 | PAL-37S | Isopropyl alcohol (g/100g) |
| 4530 | PAL-131S | Isopropyl alcohol (mL/100mL) |
| 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** | | |
| 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) |
| 4492 | PAL-92S | Ethylene glycol Freezing point of Ethylene glycol (°F) |
| **Refractive Index・Brix** | | |
| 3852 | PAL-BX/RI | Brix / Refractive Index |
| 3850 | PAL-RI | Refractive Index |
| 3840 | PAL-α | Brix |
| 3842 | PAL-LOOP | Brix |
| **Chemical products** | | |
| 4421 | PAL-21S | Dextrin |
| 4438 | PAL-38S | Dimethylformamide |
| 4440 | PAL-40S | Sodium hydroxide |
| 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 |
| **Metal working** | | |
| 4502 | PAL-102S | Cutting oil |
| 4537 | PAL-AntiRust | AntiRust |
| 4536 | PAL-Cleaner | Cleaner |
| **Soil, Civil engineering** | | |
| 4571 | PAL-Soil | Gravimetric / Volumetric Soil moisture (Dual scale) |

All ATAGO products are designed and manufactured in Japan.


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ISO9001 H.Q. & Factory

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

* Specifications and appearance are subject to change without notice.


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ENV.14 16112000PP Printed in Japan


Digital Hand-Held
"Pocket" Refractometers

# Pocket PAL series

GOOD DESIGN

Texture Technology Awards Excellence 2004

Technology for Food Industry Award 2005

**PAL-1**
Cat.No.3810
Brix 0.0 to 53.0%

**PAL-2**
Cat.No.3820
Brix 45.0 to 93.0%

**PAL-3**
Cat.No.3830
Brix 0.0 to 93.0%

**PAL-S**
Cat.No.3860 Mode S™
Brix 0.0 to 93.0% Technology Model

**PAL-22S**
Cat.No.4422
Honey moisture 12.0 to 30.0%

**PAL-39S**
Cat.No.4439
Hydrogen peroxide 0.0 to 50.0%

**Pocket-Palm-Perform**

Bluetooth® available

IP65 · ELI · High temperature sample · SUS Sample Stage · 2~3 Drops · ZERO -set · 2~3 sec. · ATC · Back Light

Patent for Design Registration No. ZL200310103015.2 (China)
Patent for Invention Registration No. 1191241 (Japan)
Patent Granted in countries around the world.

ATAGO®

# The Next Generation of Digital Refractometers

"Pocket" Refractometers **PAL** series

- Extremely water resistant (IP65)
- Can be washed under running water
- Will float if accidentally dropped in water




- Ergonomically designed for one-handed operation
- The innovative design makes it easy to pour out and remove a sample, but difficult to spill the sample.
- Automatic Temperature Compensation (ATC)
- Temperature display
- Measurement temperature up to 100℃

- Revolutionary new External Light interference (ELI) feature (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.
- Mode S : Mode S improves repeatability of samples that cause inconsistent readings.



| Low to medium | High concentration | Wide range | Powered by Mode S | Honey moisture % | Hydrogen peroxide (w/w) |
|---|---|---|---|---|---|
| PAL-1 | PAL-2 | PAL- 3 | PAL-S Mode S | PAL-22S | PAL-39S |
| Cat.No.3810 | Cat.No.3820 | Cat.No.3830 | Cat.No.3860 | Cat.No.4422 | Cat.No.4439 |

Standard accessory MAGIC™

## Optional

| Part No. | Part Name. |
|---|---|
| RE-110010 | Sucrose Solutions (for Brix confirmation)10% (±0.03% ) |
| RE-110020 | Sucrose Solutions (for Brix confirmation)20% (±0.03% ) |
| RE-110030 | Sucrose Solutions (for Brix confirmation)30% (±0.03% ) |
| RE-110040 | Sucrose Solutions (for Brix confirmation)40% (±0.04% ) |
| RE-110050 | Sucrose Solutions (for Brix confirmation)50% (±0.05% ) |
| RE-110060 | Sucrose Solutions (for Brix confirmation)60% (±0.05% ) |
| RE-39409 | PAL-CASE |
| RE-39410 | PAL-STRAP |
| RE-39446 | MAGIC™ |
| RE-39412 | Small Volume Sample Adapter for PAL |
| RE-39413 | PAL Silicone Cover |



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

* Warranty period for these solutions is 6 weeks.



**MAGIC™**
This adaptor is used for a hot sample to cool it down quickly or to minimize evaporation.



**Small Volume Sample Adapter for PAL**
Allows for measurements with a small volume of sample. Place directly on the sample stage.

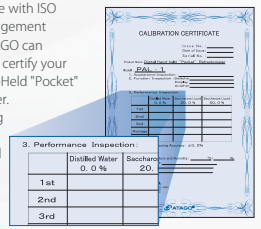

▲PAL Silicone Cover


▲PAL-CASE


▲PAL-STRAP

## Certification

In accordance with ISO Quality Management Systems, ATAGO can calibrate and certify your Digital Hand-Held "Pocket" Refractometer. The following documents will be issued (for a service free):




- Calibration Certificate
- Traceability System Diagram
- Traceability Certificate

## PAL commitment

**A new ergonomic design for comfort and ease of use!**

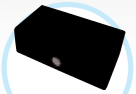
In pursuit of an "easy to use" , "easy to operate" and ergonomic architecture of new instruments, ATAGO has achieved a "palm-fitting" masterpiece as well as unit that is high in hygienic properties. By reducing the number of unnecessary assembly parts, we have reduced the risks of a germ reproductive environment. Through our efforts to produce a hygienic instrument to be used in any industry, these units are designed to be completely washable. The new PAL series has been approved by the HACCP, and are equipped with the new ELI feature, which ensures accurate measurements - even outdoors. Requests from our customers worldwide are reflected in the development of the new PAL units.

Actual Size

**Sample Stage**
The SUS sample stage allows for the sample temperature to conform quickly and evenly to the prism temperature for accurate measurements.

**START Key**
Conveniently located for single hand operation.


Calibration Report


Convenient storage case



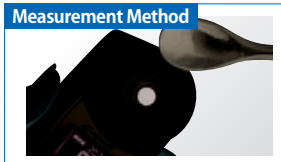

**Prism**
Made of highly durable optical glass to prevent scratching.

**Liquid Crystal Display (LCD)**
Digital measurement values are large and easy to read.
Displays battery indicator and temperature.

**ZERO Key**
For Zero Setting, place water on the prism and press.

**Strap Holder**
Suitable for wrist straps or lanyards.

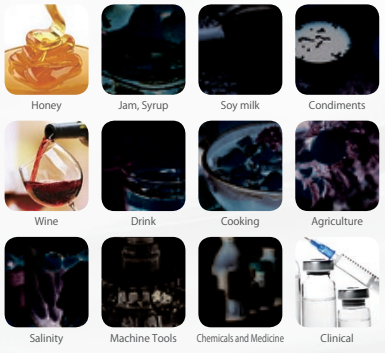
## Measurement Method


1 Apply 2-3 drops on the prism surface.


2 Press the START key.


3 Measurement value and prism temperature are displayed in 3 seconds!

## Application examples




## Specifications

| | PAL-1 Cat.No.3810 | PAL-2 Cat.No.3820 | PAL-3 Cat.No.3830 | PAL-S Cat.No.3860 | PAL-22S Cat.No.4422 | PAL-39S Cat.No.4439 |
|---|---|---|---|---|---|---|
| Measurement range | Brix 0.0 to 53.0% | Brix 45.0 to 93.0% | Brix 0.0 to 93.0% | Brix 0.0 to 93.0% | Honey moisture 12.0 to 30.0 % | Hydrogen peroxide 0.0 to 50.0% |
| Measurement Accuracy | Brix ±0.2% | | Brix ±0.1% | Brix ±0.2% | Honey moisture ±0.2 % | Hydrogen peroxide ±0.6% |
| Resolution | Brix 0.1% | | | | Honey moisture 0.1 % | Hydrogen peroxide 0.2% |
| Measurement temperature | 10 to 100°C (ATC) (Hot samples over 100° C can be measured under specified conditions. Please contact ATAGO for further details.) | | | | | |
| Ambient temperature | 10 to 40°C | | | | | |
| Power supply | 2×AAA Batteries | | | | | |
| International protection class | IP65 Water resistant | | | | | |
| Dimensions and weight | 5.5×3.1×10.9cm, 100g | | | | | |