

# All models with Near Field Communication Technology Bluetooth available as an option

Contact Atago for more information

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

Cat.No.	Model	Scale	Cat.No.	Model	Scale	Cat.No.	Model	Scale
Food, Confectionery, Food Ingredients			4404	PAL-04S	Sodium chloride (S.G.)	4491	PAL-91S	Ethylene glycol Freezing point of Ethylene glycol (°C)
4422	PAL-22S	Honey moisture	4405	PAL-05S	Sodium chloride (Baume)	4492	PAL-92S	Ethylene glycol Freezing point of Ethylene glycol (°F)
4508	PAL-Pâtissier	Brix / Baume (Dual scale)	4406	PAL-06S	Seawater (Concentration)	Refractive Index • Brix		
3807	PAL-MILK	Non-fat milk solids	4407	PAL-07S	Seawater (S.G.)	3852	PAL-BX/RI	Brix / Refractive Index
4427	PAL-27S	Soymilk	4408	PAL-08S	Seawater (Baume)	3850	PAL-RI	Refractive Index
4443	PAL-43S	Bittern (Magnesium chloride)	Moisture			3840	PAL-α	Brix
4496	PAL-96S	Chinese noodle soup / Baume of Kansui (Dual scale)	4574	PAL-Dried Fruit Moisture	Moisture	3842	PAL-LOOP	Brix
4498	PAL-98S	Condiment	4575	PAL-Dates Moisture	Moisture	Chemical products		
4439	PAL-39S	Hydrogen peroxide	Clinical, Sports			4421	PAL-21S	Dextrin
4429	PAL-29S	Citric acid	4442	PAL-42S	Cesium chloride	4438	PAL-38S	Dimethylformamide
4430	PAL-30S	Acetic acid	4453	PAL-53S	Copper sulfate (Concentration)	4440	PAL-40S	Sodium hydroxide
4432	PAL-32S	Phosphoric acid	4454	PAL-54S	Copper sulfate (S.G.)	4423	PAL-23S	Glycerin (Low concentration)
4440	PAL-40S	Sodium hydroxide	4410	PAL-10S	Urine (S.G.)	4424	PAL-24S	Glycerin (High concentration)
4464	PAL-64S	Sodium bicarbonate	4401	PAL-11S	Serum protein	4430	PAL-30S	Acetic acid
4465	PAL-65S	Sodium tartrate	4529	PAL-DOG&CAT	NEW Dog Urine (S.G.) / Cat Urine (S.G.)	4431	PAL-31S	Formic acid
4470	PAL-70S	Potassium phosphate	4510	PAL-DOG	Dog Urine (S.G.)	4432	PAL-32S	Phosphoric acid
4523	PAL-COFFEE	Brix	4511	PAL-CAT	Cat Urine (S.G.)	4444	PAL-44S	Lithium chloride
4532	PAL-COFFEE	TDS (TDS)	4512	PAL-RABBIT	Rabbit Urine (S.G.)	4445	PAL-45S	Barium chloride
4533	PAL-COFFEE	Brix / TDS (Dual scale) (BX/TDS)	Colostrum			4446	PAL-46S	Cobalt chloride
4535	PAL-Tea	Tea	3805	PAL-Colostrum	Colostrum	4447	PAL-47S	Ferric chloride
Fruit and Vegetable Growers			Alcohol liquid			4448	PAL-48S	Strontium chloride
3847	PAL-ORANGE	Brix	4433	PAL-33S	Ethyl alcohol (mL/100mL)	4449	PAL-49S	Potassium chloride
3848	PAL-TOMATO	Brix	4434	PAL-34S	Ethyl alcohol (g/100g)	4450	PAL-50S	Potassium bromide
3849	PAL-MAPLE	Brix	4436	PAL-36S	Methyl alcohol	4451	PAL-51S	Sodium bromide
Sugar			4437	PAL-37S	Isopropyl alcohol (g/100g)	4452	PAL-52S	Potassium iodide
4412	PAL-12S	Dextran	4530	PAL-131S	Isopropyl alcohol (mL/100mL)	4453	PAL-53S	Copper sulfate (Concentration)
4414	PAL-14S	Fructose	4485	PAL-85S	Polyvinyl alcohol	4454	PAL-54S	Copper sulfate (S.G.)
4415	PAL-15S	Glucose	Pharmaceutical reagents			4455	PAL-55S	Magnesium sulfate
4416	PAL-16S	High Fructose Corn syrup (HFCS-42)	4412	PAL-12S	Dextran	4456	PAL-56S	Potassium sulfate
4417	PAL-17S	High Fructose Corn syrup (HFCS-55)	4413	PAL-13S	Creatine	4457	PAL-57S	Nickel sulfate
4418	PAL-18S	Inverted suger	4423	PAL-23S	Glycerin (Low concentration)	4458	PAL-58S	Sodium sulfate
4419	PAL-19S	Lactose	4424	PAL-24S	Glycerin (High concentration)	4459	PAL-59S	Zinc sulfate
4420	PAL-20S	Maltose	4425	PAL-25S	Inulin	4460	PAL-60S	Silver nitrate
Wine, Brew			4426	PAL-26S	Mannitol	4461	PAL-61S	Sodium nitrate
4479	PAL-79S	T.A. 1990	4431	PAL-31S	Formic acid	4462	PAL-62S	Potassium carbonate
4480	PAL-80S	T.A. 1971	4432	PAL-32S	Phosphoric acid	4463	PAL-63S	Sodium carbonate
4483	PAL-83S	KMW (or Babo)	4451	PAL-51S	Sodium bromide	4464	PAL-64S	Sodium bicarbonate
4484	PAL-84S	Baume	4455	PAL-55S	Magnesium sulfate	4467	PAL-67S	Potassium chromate
4486	PAL-86S	Oe (Ger) / Brix (Dual scale)	4464	PAL-64S	Sodium bicarbonate	4468	PAL-68S	Potassium dichromate
4487	PAL-87S	Oe (Oechsle) / Brix (Dual scale)	4465	PAL-65S	Sodium tartrate	4469	PAL-69S	Sodium thiosulfate
4540	PAL-Whiskey	Ethyl alcohol	4466	PAL-66S	Potassium oxalate	4470	PAL-70S	Potassium phosphate
4541	PAL-Vodka	Ethyl alcohol	4468	PAL-68S	Potassium dichromate	4471	PAL-71S	Sodium molybdate
4542	PAL-Tequila	Ethyl alcohol	4470	PAL-70S	Potassium phosphate	4472	PAL-72S	Sodium tungstate
4543	PAL-Shochu	Ethyl alcohol	4472	PAL-72S	Sodium tungstate	Metal working		
4544	PAL-Gin	Ethyl alcohol	Automobile, Aviation, Heat Transfer, Industrial			4502	PAL-102S	Cutting oil
4545	PAL-Rum	Ethyl alcohol	4518	PAL-Urea	Urea	4537	PAL-AntiRust	AntiRust
4546	PAL-Brandy	Ethyl alcohol	4403	PAL-03S	Snow-melting agent (Sodium chloride)	4536	PAL-Cleaner	Cleaner
4590	PAL-Plato	Plato (Sweet wort)	4441	PAL-41S	Snow-melting agent (Calcium chloride)	4547	PAL-NMP	NEW N-methyl-2-pyrrolidone
Salinity, Seawater			4443	PAL-43S	Snow-melting agent (Magnesium chloride)	4558	PAL-Hydrocarbon Cleaner	NEW Hydrocarbon cleaner contamination
4403	PAL-03S	Sodium chloride (g/100g)	4488	PAL-88S	Propylene glycol Freezing point of Propylene glycol (°C)	Soil, Civil engineering		
4393	PAL-03CS	Sodium chloride (g/100g) / Freezing point of Sodium chloride (°C) (Dual scale)	4489	PAL-89S	Propylene glycol Freezing point of Propylene glycol (°F)	4571	PAL-Soil	Gravimetric / Volumetric Soil moisture (Dual scale)
4506	PAL-106S	Sodium chloride (g/100mL)						

All ATAGO products are designed and manufactured in Japan.

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**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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Digital Hand-Held  
"Pocket" Refractometers

*Pocket* PAL series

**PAL-1**

Cat.No.3810  
Brix 0.0 to 53.0%

**PAL-3**

Cat.No.3830  
Brix 0.0 to 93.0%

**PAL-H**

Cat.No.3870  
Brix 0.0 to 93.0%  
Mode H<sup>TM</sup> Technology Model

**PAL-S**

Cat.No.3860  
Brix 0.0 to 93.0%  
Mode S<sup>TM</sup> Technology Model

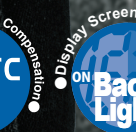
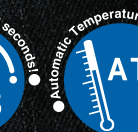
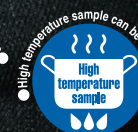
**PAL-91S**

Cat.No.4491  
Ethylene glycol 0.0 to 90.0% (V/V)

**PAL-39S**

Cat.No.4439  
Hydrogen peroxide 0.0 to 50.0%

**Pocket→Palm→Perform**



**ATAGO**

4094972, 4467933, 4889772(JP)  
7,492,447 B2(USA)  
Patent Granted in countries around the world.



# 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



- 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.



- 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)



- Mode S™: Mode S™ improves repeatability of samples that cause inconsistent readings.



- Mode H™: Mode H™ enables to measure the sample at high temperature in 2 seconds.



- Measurement history (up to 100 items) can be read by touching a contactless IC card reader / writer connected to an Android smartphone or a personal computer.

\* The N-Mark is a trademark or registered trademark of NFC Forum, Inc. in the United States and in other countries.



Low to medium

**PAL-1**

Cat.No.3810

Wide range

**PAL-3**

Cat.No.3830

Powered by Mode S™

**PAL-S**

Cat.No.3860

Standard accessory  
MAGIC™

Powered by Mode H™

**PAL-H**

Cat.No.3870

Ethylene glycol (V/V)

**PAL-91S**

Cat.No.4491

Hydrogen peroxide (W/W)

**PAL-39S**

Cat.No.4439

## Specifications

	PAL-1 Cat.No.3810	PAL-3 Cat.No.3830	PAL-S Cat.No.3860	PAL-H Cat.No.3870	PAL-91S Cat.No.4491	PAL-39S Cat.No.4439
Measurement range	Brix 0.0 to 53.0%	Brix 0.0 to 93.0%		E.G : 0.0 to 90.0 % (V/V) Freezing point : 0 to -50℃		Hydrogen peroxide 0.0 to 50.0%
Resolution	Brix 0.1%		Brix 0.5%		E.G : 0.2 % (V/V) Freezing point : 1℃	Hydrogen peroxide 0.2%
Measurement accuracy	Brix ±0.2%	Brix ±0.1%	Brix ±0.2%	Brix ±0.5%	E.G : ±0.4 % (Concentration of about 15%) Freezing point : ±1℃	Hydrogen peroxide ±0.6%
Measurement temperature	10 to 100℃ (ATC) (Hot samples over 100℃ can be measured under specified conditions. Please contact ATAGO for further details.)					10 to 35℃ (ATC)
Ambient temperature	10 to 40℃					10 to 35℃
Power supply	2×AAA Batteries					
International protection class	IP65 Water resistant					
Dimensions and weight	5.5×3.1×10.9cm, 100g					

## Application examples



## 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.

### Sample Stage

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

Actual Size

### 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

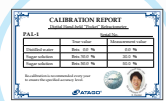
Suitable for wrist straps or lanyards.

### START Key

Conveniently located for single hand operation.

### NEW NFC

PAL series comes with Data Transmission Function with NFC technology.



Calibration Report

## 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!

## 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

