FAQ

Q How is the unit calibrated?

A Press the ZERO button while the sensor is empty and completely clean. No chemical is necessary. Perform this zero-setting daily. When measurement values seem to be off, calibrate the unit with a standard saline solution.
Contact ATAGO for purchase.

Q Can tap water be used for sample dilution?

A Always use distilled water whenever possible. If tap water is used, make sure that the water reads “0 (zero)” in advance.

Q Do other electrolytes besides salt affect the readings?

A The amount of other electrolytes found in food is negligible, usually less than 1%.

Q Does the Mohr method and ATAGO salt meters use the same measurement principles?

A The Mohr method, also known as a silver nitrate titration method, utilizes the characteristic of silver nitrate that reacts with chloride ions to measure the salinity %. The ATAGO salt meters employ the electric conductivity method. Both methods measure the salinity but operate on different measurement principles. However, by creating a conversion table between the two testing methods, correlation between the set of results can be seen.

Q Can the instrument measure the non-sodium total dissolved solids?

A Non-sodium total dissolved solids = Brix – (salinity % x 1.18). A refractometer with the Brix scale is required. The salinity % is multiplied by 1.18 to be converted into a Brix value.

NaCl Solution (for calibration)

Part#	Part name	NaCl concentration	Contents
RE-120250	NaCl Solution 2.50% AB250 for PAL-ES2, ES3 calibration	2.50 ± 0.05% (g/100g)	Approx. 5ml
RE-120284	NaCl Solution 2.84% AB284 for ES-421 calibration	2.84 ± 0.05% (g/100g)	Approx. 5ml

Free Demo Available

Specifications

	ES-421	PAL-ES2	PAL-ES3
Cat#	4210	4232	4233
Measurement method	Conductivity method		
Measurement range	0.00 to 10.0% (g/100g)	0.00 to 5.00% (g/100g)	0.0 to 33.0% (g/100ml) (Measures the distilled water diluted sample to 10 times (by weight). Indicates the salt concentration in percentages (g/100ml) of the former sample before dilution.)
Resolution	0.01% for salt concentration of 0.00 to 2.99% 0.1% for salt concentration of 3.0 to 10.0%	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 accuracy	Displayed value ±0.05% (for salt concentration of 0.00 to 1.00%) Relative precision ±less than 5% (for salt concentration of 1.00 to 10.0%)	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)
Temperature compensation	10 to 40°C	10 to 40°C (Guaranteed accuracy range 15 to 35°C)	
Ambient temperature	10 to 40°C	10 to 40°C	
Power supply	006P dry battery (9V)	2× AAA alkaline batteries	
International protection class	————	IP65 dust-tight and protected against water jets	
Dimensions and weight	17(W)×9(D)×4(H)cm, 300g	5.5(W)×3.1(D)×10.9(H)cm, 100g	

All ATAGO salt meters are designed and manufactured in Japan.

HACCP GMP GLP

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

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ISO9001 REGISTERED H.Q. & Factory

Specifications and appearance are subject to change without notice.

V.01 11042500PP

Digital Salt Meters

ES-421
PAL-ES

Fast
Easy
Washable PAL-ES

Free Demo Available
overseas@atago.net

ATAGO salt meters utilize the electric conductivity method and require no reagent solutions. Reduce costs and minimize risk by managing salt concentrations. With an attractive compact body and simple-to-use design, you'll want to always keep it close at hand.

Improved efficiency is guaranteed when used together with conventional titration methods.

84% of customers who evaluated the instrument have purchased.

Experience the convenience for yourself.

ATAGO®

The New Global Standard

Digital Salt Meters ES-421 / PAL-ES

Why measure salt content?

Adding salt is one of the most critical processes in food manufacturing as it has a significant effect on the color, taste, and texture of food.

ATAGO salt meters are ideal for quick and easy salinity checks on the production floor.

Recently, in addition to use in the production area, many companies are validating our salt meters as the preferred method in lab settings as well. Food scientists are choosing to limit the use of precipitation titration with harmful silver nitrate (Mohr's Method).

Because ATAGO salt meters are safe, fast, and simple.

Due to the difference in measurement principles, readings from the conductivity salt meters may not match up exactly with the readings by titration for certain samples. However, by creating a conversion table between the two testing methods, correlation between the set of results can be seen.

Unlike titration, no expensive and harmful chemical is involved in the measurement process.

ATAGO delivers the revolutionary salinity measurement solution that is both eco-friendly and cost-effective.

Why choose ATAGO?

1. **Fast -** Results are displayed within 3 seconds.
2. **Easy measurement -** Just press the START button.
3. **Easy calibration**
   - Clean the sensor and press the ZERO button.
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.

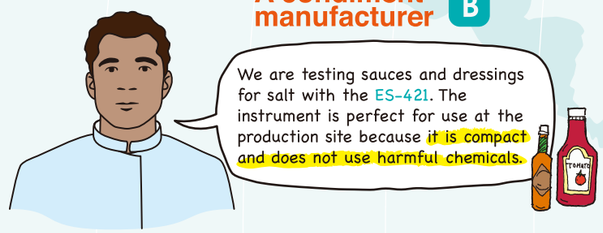
*Applicable only for the PAL-ES2 and PAL-ES3.

A frozen vegetable processor A

The vegetables are blanched and flash frozen. The salt content of the blanching water is important for maintaining the bright colors of vegetables. If it's too low, the vegetables lose their colors, and if it's too high, they taste salty. The water is boiling all day long, and water and salt are added throughout the day. We did not realize how much the salinity changed until we started using the PAL-ES2. Now we perform tests at fixed time intervals.

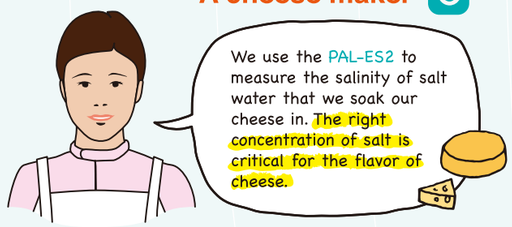
A condiment manufacturer B

We are testing sauces and dressings for salt with the ES-421. The instrument is perfect for use at the production site because it is compact and does not use harmful chemicals.



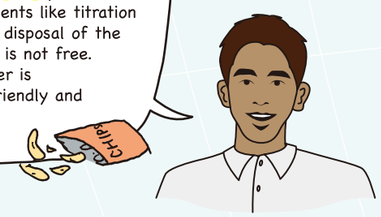
A cheese maker C

We use the PAL-ES2 to measure the salinity of salt water that we soak our cheese in. The right concentration of salt is critical for the flavor of cheese.



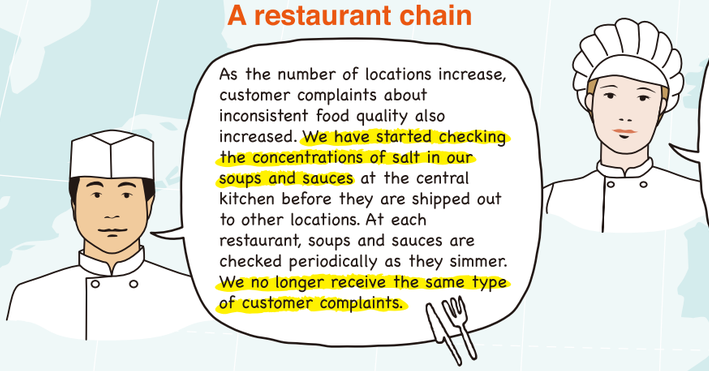
A potato chips manufacturer D

Salt is sprinkled on fried potato slices from a machine, and the amount of salt dispensed is checked and adjusted at the beginning of a production lot. In the past, we had to take samples to the lab for testing, but now we can do it right at the production line. The ES-421 saves us time and money because it does not use reagents like titration systems. Even the disposal of the titrating reagents is not free. ATAGO's salt meter is environmentally friendly and economical.



A restaurant chain

As the number of locations increase, customer complaints about inconsistent food quality also increased. We have started checking the concentrations of salt in our soups and sauces at the central kitchen before they are shipped out to other locations. At each restaurant, soups and sauces are checked periodically as they simmer. We no longer receive the same type of customer complaints.

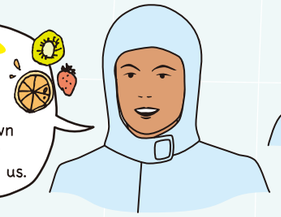


A bakery

Salt is an important ingredient in baking bread. We are monitoring the salinity of bread dough to be around 1-2%. It is impossible to tell whether or not the salt was added to the dough from the appearance.
Ever since we implemented the ES-421 in our production line, we have not forgotten to add salt. We can prevent substandard products from reaching to customers by salt testing.

A fresh cut fruit processor

We use 2% saline solutions with a small amount of ascorbic acid to prevent discoloration of fruits. Especially apples turn brown quickly. Monitoring the salt concentration is critical for us.



A pickles manufacturer

We are using the PAL-ES2 to measure pickles after the curing salt is washed off. The instrument is convenient and easy to use. Pickles are minced and diluted with water to a 10% concentration, and then measured with the PAL-ES2. We also use a hand-held refractometer to measure the salinity of the brine for our salt-packed products. This is even more convenient because dilution is unnecessary. Both the salt meter and refractometer play important roles in the production for different purposes.

Testimonials by Our Users Worldwide

A deli food supplier

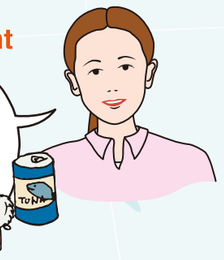
A grocery store that carries our products came to our facility for inspection, and we were told to thoroughly monitor the amount of salt that goes into the food. After evaluating several different salt meters including ones with a probe, we decided on the PAL-ES2. We used to rely on taste tests, but now we measure with the salt meter immediately after salt is added. We send the test data to the grocery store.

A restaurant

We list the salt content and calories of our food items on our menu. We are monitoring the salt content of food in the kitchen to make sure that readings stay close to the specified salt content.

A canned food manufacturing plant

We are using the PAL-ES2 to measure the brine for canned tuna. It is easy to use and completely washable under the faucet. We liked it so much that we purchased a second unit.

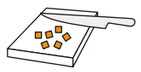


A cold cut meat manufacturer

We use the ES-421 to measure the salt concentration of ham and deli salads. We love the unit and feel that the unit will soon pay for itself.

How to Measure

A	B	C		D
Soup Stock Brine	Sauces Soups	Butter Cheese	Meats Fish	Pickles	Snacks



Dicing

Mincing the sample increases the surface area to allow as much salt to be released into the water as possible.

Crushing

Crush the sample in a bag.

Dilution

Dilute the sample with water to a 10% ratio.

Filtration

Filter the diluted sample through a cheesecloth or coffee filter for improved stability.

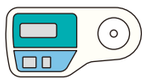
Measurement in 3 sec.

PAL-ES2
Washable

Apply 2-3 drops onto the sensor section.

Press the START key.

Measurement value is displayed in 3 seconds.



ES-421

Wide measurement range

Apply 2-3 drops onto the sensor section.

Press the START key.

Measurement value is displayed in 3 seconds.

Multiplication

× 10 = 2.9 (Actual salt content %)

The actual salt concentration in percentage is obtained by multiplying the measured value by 10.

Applicable only for the ES-421 and PAL-ES2.
The measurement method of the PAL-ES3 is slightly different. Contact ATAGO for details.

www.atago.net

Commonly Measured Food Samples

%(g/100g)

A

Soup stock Brine

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

If the sample is drinkable as is, no dilution is required.

B

Sauces

Gravy	0.8
White sauce	0.9
Demi-glace	1.1
Pasta sauce	1.2
Mayonnaise	1.6
Tomato puree	1.7
Dressing	1.7
Taco sauce	2.0
Steak sauce	2.0
Ketchup	3.0
Savory pancake sauce	4.5
BBQ sauce	4.8
Sushi vinegar	5.2
Noodle dipping sauce	5.8
Soy sauce dressing	6.1
Kimuchi paste	6.1
Yakitori sauce	6.5
Habanero sauce	6.8
Broad bean butter	7.0
Oyster sauce	9.4
Bean paste	11.0
Soy sauce	13.0
Fish sauce	21.0

Soups

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

If the solution tends to separate, collect from the middle layer that is homogenous. If the sample is oily, such as dressing, allow the oil in the liquid to float to the top, and then collect a sample from the layer underneath the oil, using a pipette, for improved repeatability.

C

Butter Cheese

Butter	0.1
Mozzarella	0.7
Gouda	0.9
Emmental	1.1
Maribo	1.6
Brie	1.8
Gorgonzola	3.6

Dilute the sample with hot water to a 10% ratio. After the sample has melted, fat will float to the top. Collect the sample with a pipette from the layer underneath the fat. Note: Some water will evaporate, so the dilution ratio may not be accurate. Make sure any undissolved solids are liquefied as much as possible before measuring.

Meats

Sausage	0.8
Ham	1.1
Salami	1.6
Bacon	1.7
Prosciutto	3.2

Fish

Sardine	1.0
Tuna	1.1
Pickled octopus	1.3
Salmon	2.4
Salmon roe	2.8
Salted fish viscera	3.2
Salted cod roe	5.2
Anchovy	10.0

Dilute the minced sample with water and let it sit for about 3 minutes before measuring. Let it sit longer, for about 5 minutes, if the sample was diced in larger pieces.

Pickles

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

If the solution contains large pieces of sample, collect from the top layer with no undissolved solids.

D

Snacks

Chips	1.4
Crackers	2.3

Solid samples that crumble easily. Dilute the sample that contains oil and undissolved solids with water, filter out the solids, and measure.

Your sample is not listed? Contact ATAGO.

Free Demo Available
overseas@atago.net

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