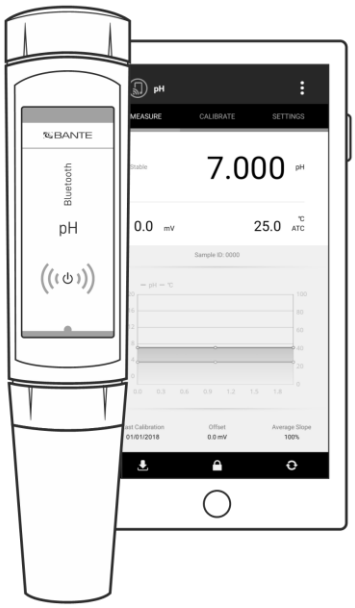
BANTE instruments

S series Bluetooth pH/ORP/Ion/Conductivity/DO Testers

USER MANUAL



Bante Instruments Inc.

CE

Table of Contents

Overview

This section is applicable to all models of the S series testers

Tester Overview

Thank you for selecting the S series bluetooth water quality tester, this product series includes 6 models.

Model	Measurement Parameters	Sensor ID
S10	pH	PH *********
S20	ORP (mV, relative mV)	POI *********
S30	Ion concentration	ION *********
S40	Water hardness	ION *********
S50	Conductivity, TDS, salinity, resistivity, conductivity ash	EC *********
S60	Dissolved oxygen, BOD, oxygen uptake rate (OUR), specific oxygen uptake rate (SOUR)	DO *********

This user manual provides a step-by-step guide to help you operate the testers and app, please carefully read the following instruction according to the model you have purchased.

Environmental Conditions

Before unpacking, ensure that current environmental conditions meet the following requirements.

- Relative humidity is less than 80%
- Ambient temperature between 0°C (32°F) and 50°C (122°F)
- No potential electromagnetic interference

Packing List

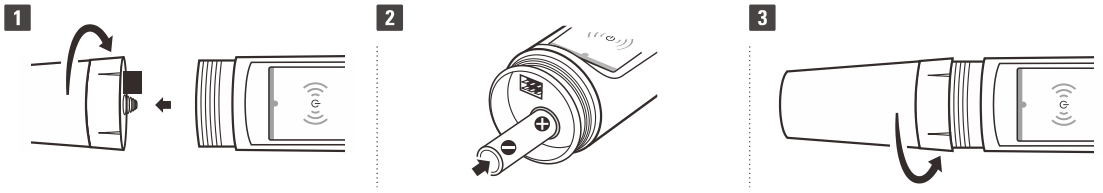
The following list describes all components of the tester. If any items are missing or damaged, contact the supplier immediately.

Model	Components
S10	Tester, pH buffer solutions 4.01, 7.00, 10.01
S20	Tester, solution storage bottles
S30	Tester, ion selective electrode, standard solutions 100, 1000 ppm, ionic strength adjuster
S40	Tester, water hardness electrode, standard solutions 10, 100 mmol/L, ionic strength adjuster
S50-M	Tester, conductivity standard solutions 84 µS/cm, 1413 µS/cm, 12.88 mS/cm
S50-H	Tester, conductivity standard solutions 1413 µS/cm, 12.88 mS/cm, 111.8 mS/cm
S60	Tester, dissolved oxygen electrode, electrolyte solution, membrane cap

S30-Cn and S30-S ion testers do not provide above solutions.

Installing the Batteries

1. Take out the tester from carrying case. Twist the electrode collar counter clockwise, pull the electrode (or connector) away from the tester.
2. Insert the two AAA alkaline batteries into the battery compartment, note polarity.
3. Push the electrode (or connector) into the tester and twist the electrode collar clockwise until tight.



Switching the Tester On and Off

Press the ⏻ key to switch on the tester, press the key again to switch off the tester.

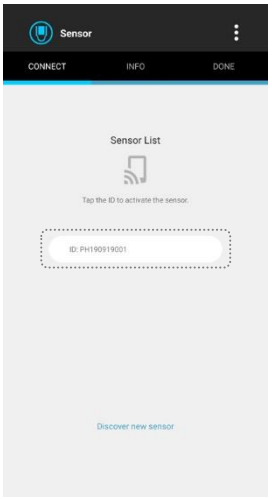
BanteLab App

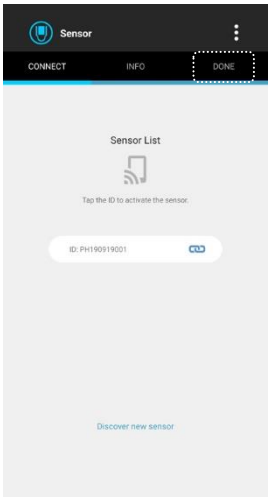
Download the Software

Bante Instruments provides a powerful app that is used for receiving the data form S series testers. You are able to download this software from our official website at www.bante-china.com or scan the QR code below. Before installation, make sure that you have Android smartphone or tablet and this device with Bluetooth 4.0 or newer.

Connecting the Tester

1. Tap the BanteLab icon, the application starts.
2. If you want to print the data with an operator ID, tap and enter the username in the text field .
3. Tap the **Enter**, the app begins searching for connectable testers, the screen shows a sensor list.
4. Tap the **ID** and wait until the connection icon appears.
5. Tap the **Done** to enter the measurement screen.



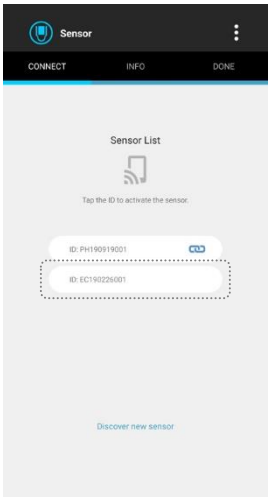


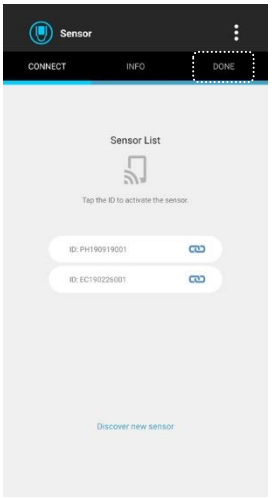
- The BanteLab app is capable of connecting up to 3 testers for multiparameter measurement. If the icon does not appear during the connection, please do not tap the ID again.
- If the screen shows "*The sensor has been connected* ", but the icon does not appear for a long time. Please switch off the tester and wait for 10 seconds, then switch on the tester again. If necessary, restart the app.
- If the tester has switched off, but the ID still shows on the screen. Restart the app, the screen will refresh the sensor list.

Connecting Multiple Testers

During the measurement, if you want to connect multiple testers to app, please follow the steps below.

1. Tap the ⋮ .
2. Tap the **Discover Sensor**.
3. Tap the **ID** and wait until the ⛓ icon appears.
4. Tap the **Done** to return to the measurement screen.

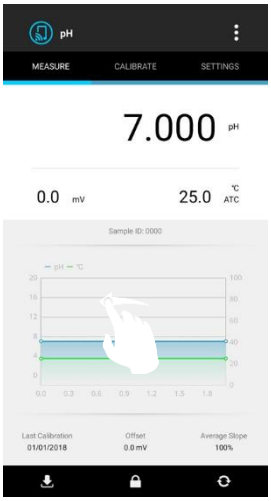


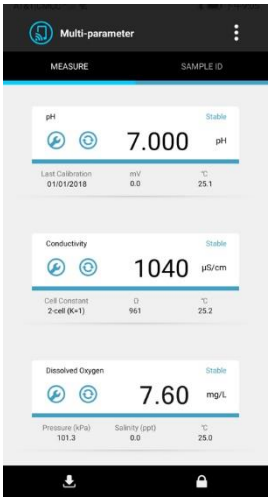


Note, the pH, ORP, ion and water hardness testers can not connect to app simultaneously.

Switching the Measurement Screen

The BanteLab app contains two measurement screens in the single parameter measurement mode. The default is graph. Swipe the graphics area, the data table will show on the screen. If 2 or 3 testers have connected to app, the screen will automatically switch to the multiparameter measurement mode.





Function Keys

Icon	Function
	Save current reading to memory or send the data to printer (depending on the Data Transfer setting in setup menu)
	Lock or unlock the measurement
	Select the measurement mode
	Return to the single parameter measurement mode
	Switch the measurement parameter
	Return to the previous screen

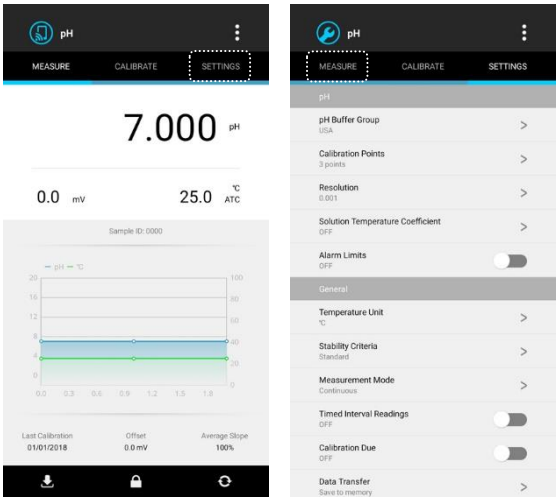
General Settings

The BanteLab app contains an integrated setup menu that is used to customize the tester parameters. In the different modes, the screen will show the corresponding menu items. For the general settings, the option will be applied to all testers once setting is changed.

Menu Item	Option	Description	Default
Temperature Unit	°C °F	Set the default temperature unit.	°C
Stability Criteria	Fast Standard Slow	Set when a measurement is recognized as stable. • When the Fast option is selected, the screen will show Stable icon quickly, but the repeatability is not good. • When the Slow option is selected, the icon will take longer to appear, but guarantees high accuracy of the measurement. • When the Standard option is selected, the app will balance the response speed and accuracy.	Standard
Measurement Mode	Auto-Read Continuous	Set the measurement read type. • When the Auto-Read is selected, the app will automatically sense a stable reading and lock the measurement, the HOLD icon appears on the screen. • When the Continuous read is selected, the reading will continuously update.	Continuous
Timed Interval Readings	10/30/60/300 seconds Off	Set the time interval for sending reading to memory or printer.	Off
Calibration Due	1 to 99 days Off	Set the calibration interval to activate alarm. If the tester is not calibrated within a specified time period, the screen will show a reminder.	Off
Data Transfer	Save to memory Send to printer	Set the data transfer type.	Memory
Password Protect	Enable Disable	Set the password protection for preventing the unauthorized calibration and settings. If enabled, the user must enter a 6-digit password to access above modes.	Disable
Multiparameter Display	Enable	If the multiple testers have connected to app, tap this option to return to the multiparameter measurement screen.	---
Factory Reset	Enable Disable	Reset the tester to factory default settings. Note that the tester must be recalibrated.	Disable

Setting the Default Option

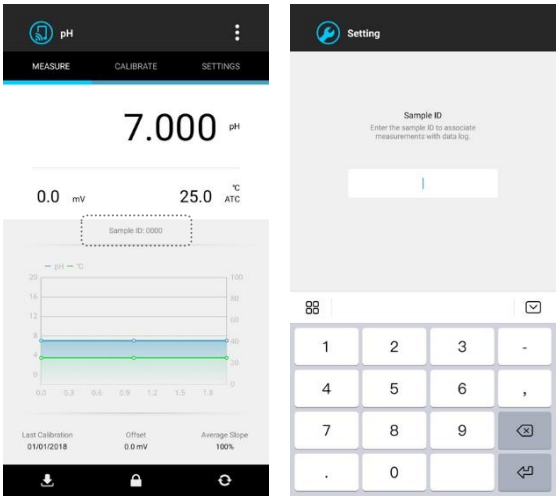
1. Tap the **Settings** and select an option.
2. Tap the **Measure** to return to the measurement screen.



- If the app is in the multiparameter measurement screen, tap the ⚙ to enter the single parameter measurement screen.
- Tap the **Settings** and select an option.
- Tap the **Multiparameter Display** to return to the measurements.

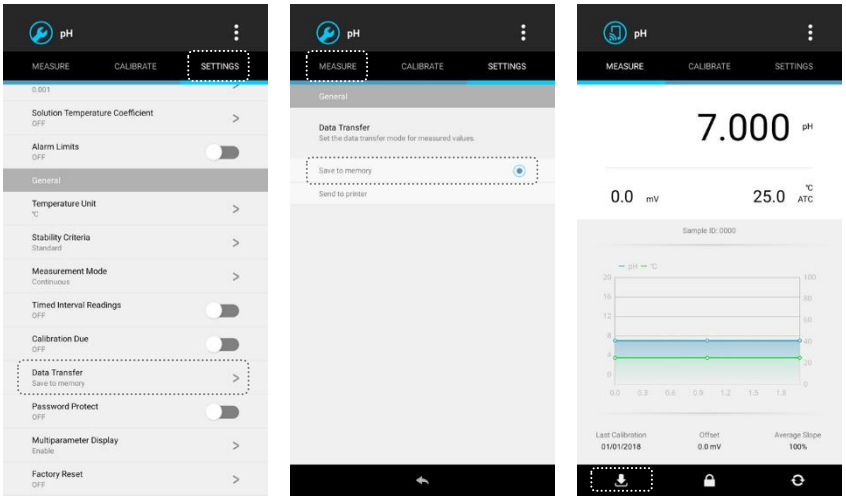
Setting the Sample ID

1. Tap the **Sample ID** on the measurement screen.
2. Tap the numeric keypad to enter the 4-digit number.
3. Tap the **Done** to return to the measurement screen.



Storing the Measurement Data

1. Ensure that the Data Transfer option in setup menu is switched to **Save to memory**.
2. Tap the , the screen shows "*Measured value has stored into memory*".

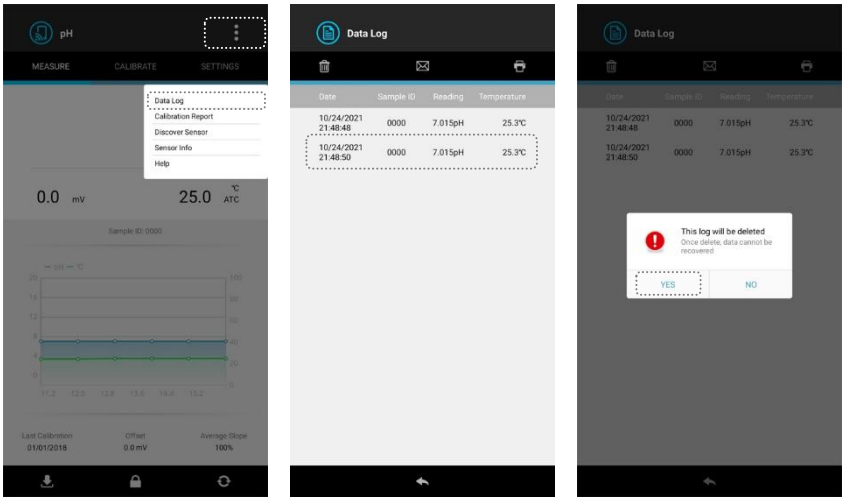


Viewing the Data Log

1. Tap the .
2. Tap the **Data Log**.
3. Tap the to return to the measurement screen.

Deleting the Data Log

- Delete single data: Tap and hold the data bar, the screen shows "*This log will be deleted*". Tap the **Yes** to confirm.
- Delete all data: Tap the , the screen shows "*Are you sure you want to delete all logs?*" Tap the **Yes** to confirm.

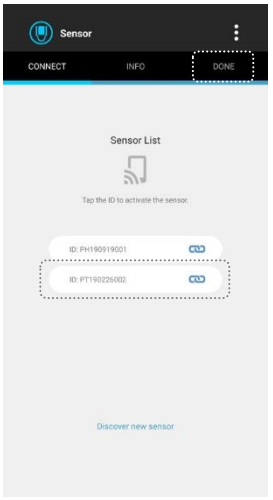


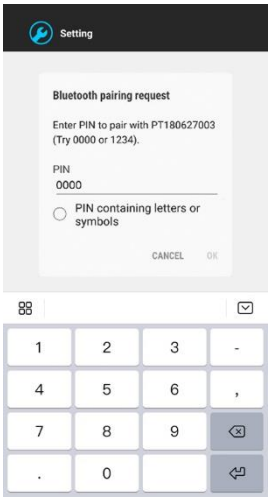
Note, deleted data can not be restored.

Connecting the Printer

Bante Instruments provides a ZJ5890C bluetooth printer for printing the measurement data (sold separately).

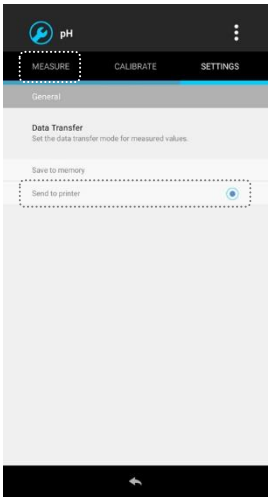
1. Switch on the printer.
2. Tap the ⋮ .
3. Tap the **Discover Sensor**.
4. Tap the **ID: PT** ********* and wait until the ⊂⊃ icon appears.
5. Tap the **Done**, the screen shows "*Bluetooth pairing request* " and waits for entering the PIN code.
6. Enter the **0000** and confirm, the printer will automatically print the "*Printer is ready* ".





Printing the Measurement Data

1. Ensure that the Data Transfer option in setup menu is switched to **Send to printer**.
2. Tap the 🖶 to print the displayed reading.

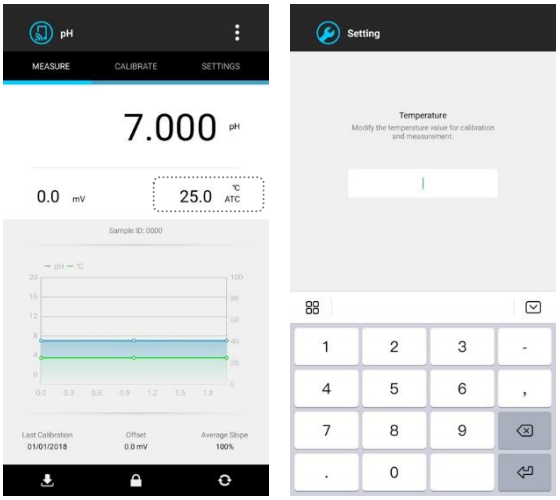


ⓘ If you need to print the all of stored readings, tap the ⋮ , tap the **Data Log**, tap the 🖶 .

Temperature Calibration

The S10 and S50 testers are installed with a built-in temperature sensor. During the measurement, if the measured temperature reading differs from that of an accurate thermometer, the tester should be calibrated.

1. Place the tester into the solution with a known accurate temperature, wait until the measurement is stable.
2. Tap the temperature reading on the measurement screen.
3. Tap the numeric keypad to modify the temperature.
4. Tap the **Done** to return to the measurement screen.



If the input value exceeds the allowable range, the app will automatically correct the temperature to 0°C or 105°C.

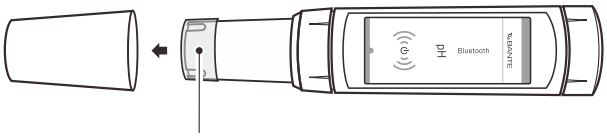
S10

pH Calibration and Measurement

This section is applicable to model S10 tester

Prior to Use

1. Remove the protective cap and translucent cover from the bottom of the tester. If some salt crystals deposited on the electrode, rinse with tap water to clean these deposits. If tiny air bubbles are present inside the pH-sensitive glass membrane, gently shake the tester downward to remove air bubbles. If the glass membrane has dried out, soak the electrode in 3M KCl or pH 4.01 buffer solution for about 30 minutes.
2. Tap the ↻ , tap the **pH** to enter the measurement screen.



3M KCl solution

pH-sensitive glass membrane

pH Settings

The BanteLab app contains 5 pH settings and 9 general settings in the setup menu.

Menu Item	Option	Description	Default
pH Buffer Group	USA	Set the pH buffer group for calibration and auto-recognition.	USA
	NIST		
	DIN		
	Custom (any 2 to 5 values >1 pH apart)		
Calibration Points	1 to 5 points	Set the number of calibration points.	3 points
Resolution	0.001	Set the resolution of the pH measurement.	0.001
	0.01		
	0.1		
Solution Temperature Coefficient	High purity water	Solution temperature coefficient is used to correct the pure water sample with a conductivity of less than 30 µS/cm. If enabled, the readings will automatically reference to 25°C (77°F).	Off
	Sample contained the ammonia or phosphate		
	Off		
Alarm Limits	Enable	Set the high and low limit values to activate alarm.	Disable
	Disable		

i To change the current settings, refer to the ***Setting the Default Option*** section on page 7.

pH Calibration

The S10 tester allows 1 to 5 points calibration in the pH mode. We recommend that you perform at least 2 points calibration for high accuracy measurement. The tester will automatically recognize and calibrate to following standard buffer values.

USA standard buffers	pH 1.68, 4.01, 7.00, 10.01, 12.45
NIST standard buffers	pH 1.68, 4.01, 6.86, 9.18, 12.45
DIN standard buffers	pH 1.09, 4.65, 6.79, 9.23, 12.75

If the Custom option is selected, the tester will only allow 2 to 5 points calibration. Single point calibration should only be carried out with pH 7.00, 6.86 or 6.79, otherwise calibration will not be accepted.
For better accuracy, we recommend calibrating the tester regularly. DO NOT reuse the buffer solutions after calibration, contaminants in solution will affect the calibration and eventually the accuracy of the measurement.

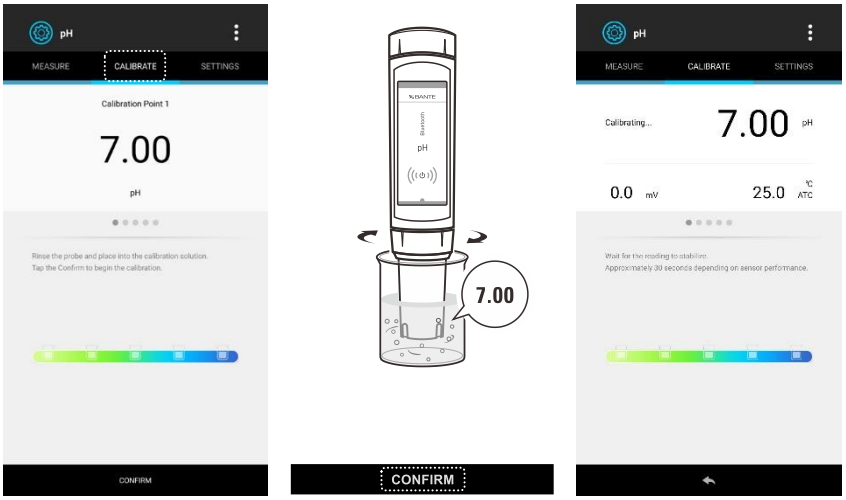
Single Point Calibration

Ensure that you have selected 1 point calibration in the setup menu.

1.1 Tap the **Calibrate**, the screen shows "*Calibration Point 1, 7.00 pH*" (or 6.86, or 6.79 pH, depending on the selected pH buffer group).

1.2 Rinse the electrode with distilled water and place into the pH 7.00 buffer solution, stir the tester gently to create a homogeneous solution.

1.3 Wait for 5 seconds, tap the **Confirm** to begin the calibration. When the reading has stabilized, the screen will automatically show "*Calibration is completed*".



Multipoint Calibration

Ensure that you have selected 2 to 5 points calibration in the setup menu.

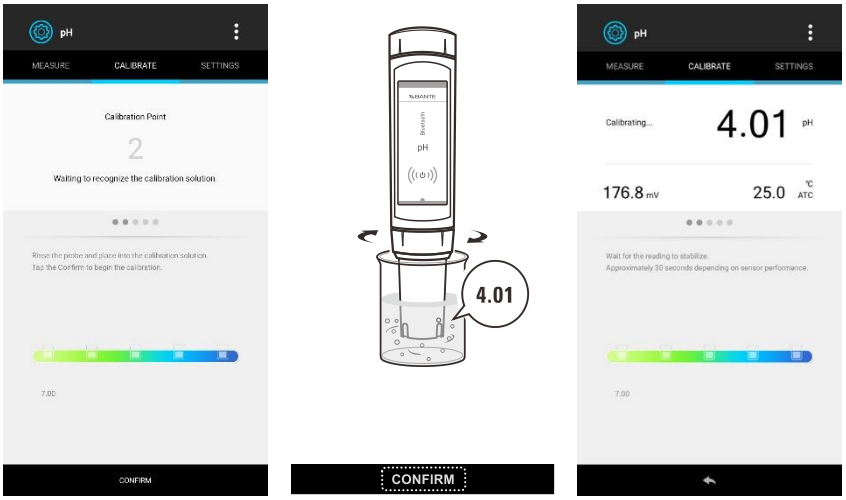
2.1 Repeat steps 1.1 through 1.3 above. When the first calibration point is completed, the screen will show "*Calibration Point 2*", the app prompts you to continue with second point calibration.

2.2 Rinse the electrode with distilled water and place into the next buffer solution (e.g., pH 4.01), stir the tester gently.

2.3 Wait for 5 seconds, tap the **Confirm**, the tester automatically recognizes the buffer solution and begins the calibration.

2.4 When the reading has stabilized, the screen will show "*Calibration Point 3*", the app prompts you to continue with third point calibration.

2.5 Repeat steps 2.2 and 2.3 above until the screen shows "*Calibration is completed*".



pH Calibration with Custom Buffers

Ensure that you have select the Custom option in the setup menu, the calibration solutions should be at least 1 pH unit apart from each other.

3.1 Rinse the electrode with distilled water and place into the buffer solution, stir the tester gently and wait until the measurement is stable.
3.2 Tap the **Calibrate**.
3.3 Tap the **<** or **>** to set the calibration value.
3.4 Wait for 5 seconds, tap the **Confirm** to begin the calibration.
3.5 When the reading has stabilized, the screen will show "*Calibration Point 2*", the app prompts you to continue with second point calibration.
3.6 Repeat steps 3.1, 3.3 and 3.4 above until the screen shows "*Calibration is completed*".

To exit the calibration without saving changes, tap the **Measure**.

Viewing the Calibration Log

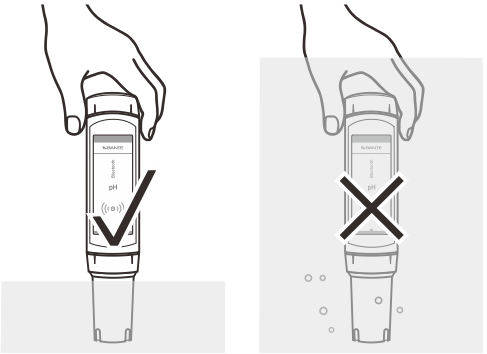
4.1 Tap the ⋮ .
4.2 Tap the **Calibration Report**.
4.3 Tap the ↩ to return to the measurement screen.

- If the tester is not calibrated or custom buffers are used, the calibration report will show ---- only.
- If the calculated electrode slope is not between 70% and 110%, please check the electrode and make sure that the buffer solutions are fresh and uncontaminated. If the pH buffers are in the good condition, please replace the electrode.

Measurements

pH

Rinse the electrode with distilled water, place the electrode into the sample solution and stir gently. Note, DO NOT completely immerse the tester in water. Wait for the measurement to stabilize and record the reading.



If the tester installed a spear tip electrode or flat surface electrode (refer to the ***Optional Accessories > pH Electrodes*** section on page 16) and the samples are soft solid or semi-solid, wet the sample with clean water, then slight pressure the electrode to take measure. Note that the pH-sensitive membrane must be fully touched with sample surface.

- During the measurement, never wipe the pH-sensitive membrane as this will cause static interference, blot dry with a lint-free tissue to remove waterdrops on electrode.
- If the Auto-Read option is enabled in the setup menu, the app will automatically lock a measurement endpoint and show HOLD icon. Tap the 🔒 to resume measuring.

mV

Tap the ⟳ , tap the **mV**, the screen shows millivolt readings.

Electrode Maintenance and Replacement

Cleaning the pH Electrode

- Since the pH-sensitive membrane is susceptible to contamination, make sure that rinse the electrode thoroughly with distilled water after use.
- If your sample contains the oil or grease, soak the electrode in mild detergent or electrode cleaning solution for at least 15 minutes, then rinse with distilled water.
- If you do not use the tester for a period longer than 1 month, store the electrode in 3M KCl solution or electrode storage solution.

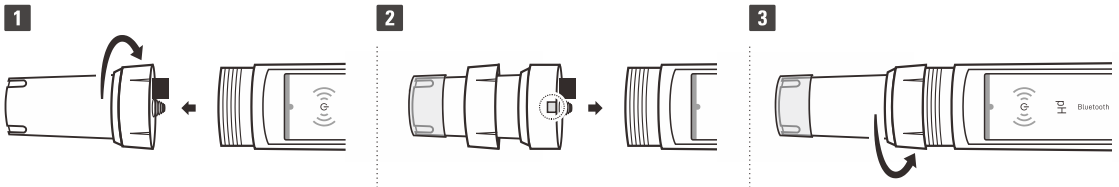
⚠

DO NOT store the electrode in distilled or deionized water, which will deplete the hydration layer of the pH-sensitive membrane and render the electrode useless.

Replacing the pH Electrode

If the tester fails to calibrate or gives fluctuating readings, you should consider replacing the electrode.

1. Twist the electrode collar counter clockwise, pull the electrode away from the tester.
2. Align the slot on the new electrode, gently push the electrode into the tester.
3. Twist the electrode collar clockwise until tight.

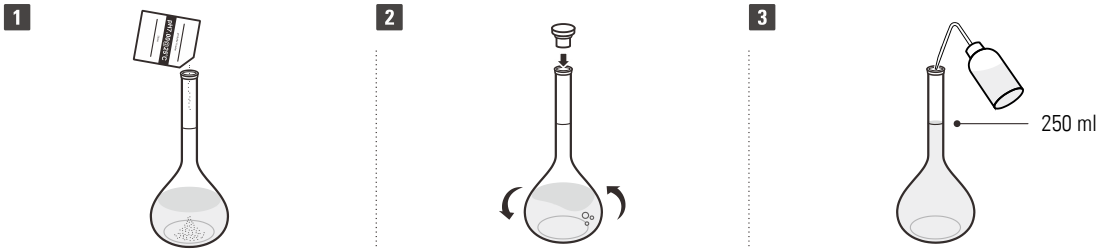


Appendix

Preparation of pH Buffer Solutions

The S10 tester is packaged with the pH 4.01, 7.00, 10.01 buffer sachets required for calibration.

1. Half fill a 250 ml volumetric flask with distilled water and add the pH 7.00 buffer reagent.
2. Swirl the volumetric flask gently to dissolve the reagent and fill to the mark with distilled water.
3. Cap and upend the volumetric flask several times to mix solution.



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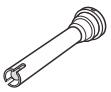
- Preparation of pH 4.01 and 10.01 buffer solutions are the same as above.
- Prepared buffer solution should be stored in hermetically sealed glass container and avoid direct sunlight.

Preparation of Electrode Storage Solution

1. Dissolve 24.6 grams of analytical grade KCl reagent in 100 ml distilled water.
2. Add pH 4.01 standard buffer and adjust solution to pH 4.

Optional Accessories

pH Electrodes

	Order Code	Description
	E-PHscan-**ST**-10K	• Circular pH-sensitive membrane • For measuring the general water samples (non-viscous, non-corrosive liquids)
	E-PHscan-**FT**-10K	• Flat surface pH-sensitive membrane • For measuring the surfaces of semi-solid or gel samples, such as cream, doughs, paper, textiles, paints, coatings, printing inks, etc.
	E-PHscan-**LT**-10K	• Circular pH-sensitive membrane • Electrode dimensions: 75×12.5 (Ø) mm • For measuring the samples in small containers, such as test tube
	E-PHscan-**PT**-10K	• Spear tip pH-sensitive membrane. • For penetrating and measuring the semi-solid samples, such as soil, vegetables, fruits, meats, cheeses, etc.

Solutions

	Order Code	Description
	PHCS-USA	pH 4.01, 7.00, 10.01 buffer solutions, 480 ml
	PHCS-NIST	pH 4.01, 6.86, 9.18 buffer solutions, 480 ml
	PHCS-ES	Electrode storage solution, 480 ml
	PHCS-GC	Electrode cleaning solution, removes inorganic residues, 480 ml
	PHCS-PR	Electrode cleaning solution, removes protein contamination, 480 ml

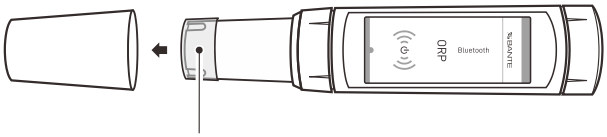
S20

ORP Calibration and **mV** Measurement

This section is applicable to model S20 tester

Prior to Use

1. Remove the protective cap and translucent cover from the bottom of the tester. If some salt crystals deposited on the electrode, rinse with tap water to clean these deposits. If the platinum sensor has dried out, soak the electrode in 4M KCl solution or tap water for about 30 minutes.
2. Tap the ↻ , tap the **ORP** to enter the measurement screen.



4M KCl solution

Platinum sensor

ORP Settings

The BanteLab app contains 2 ORP settings and 9 general settings in the setup menu.

Menu Item	Option	Description	Default
Resolution	0.1	Set the resolution of mV measurement.	0.1
	1		
Alarm Limits	Enable	Set the high and low limit values to activate alarm.	Disable
	Disable		

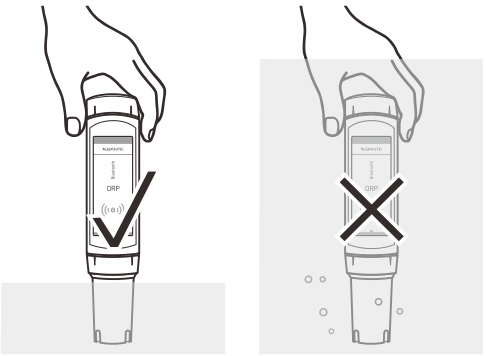
ⓘ To change the current settings, refer to the ***Setting the Default Option*** section on page 7.

Measurement

The S20 tester contains two millivolt measurement modes.

- **Raw millivolt** (mV): Tap the ↻ and tap the **mV** to enter the absolute millivolt measurement mode.
- **Relative millivolt** (R.mV): Tap the ↻ and tap the **ORP** to enter the relative millivolt measurement mode.

Select one of the above modes. Rinse the electrode with distilled water. Place the electrode into the sample solution and stir gently. Note, DO NOT completely immerse the tester in water. Wait for the measurement to stabilize and record the reading.



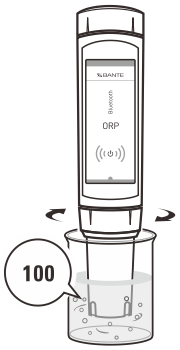
ⓘ

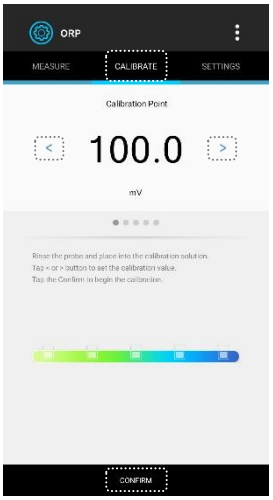
- The platinum sensor may give unstable readings in solutions that contain chromous, vanadous and titanous ions or other ions that are stronger reducing agents than hydrogen or platinum.
- If the Auto-Read option is enabled in the setup menu, the app will automatically lock a measurement endpoint and show HOLD icon. Tap the 🔒 to resume measuring.

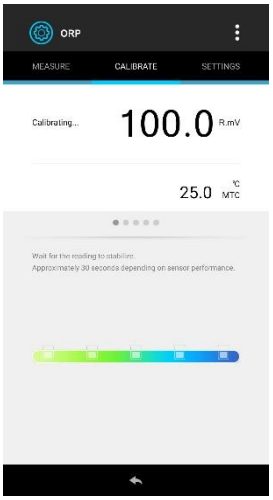
ORP Calibration

The S20 tester allows 1 point calibration in the ORP mode, but calibration is not necessary unless exact readout agreement with a work standard and at a specific ORP value is needed.

1.1 Rinse the electrode with distilled water and place into the standard solution, stir tester gently and wait until the measurement is stable.
1.2 Tap the **Calibrate** and tap the **<** or **>** to set the calibration value.
1.3 Tap the **Confirm** to begin the calibration. When the reading has stabilized, the screen will show "*Calibration is completed*".







Viewing the Calibration Log

2.1 Tap the ⋮ .
2.2 Tap the **Calibration Report**.
2.3 Tap the ↩ to return to the measurement screen.

If the tester is not calibrated, the calibration report will show ---- only.

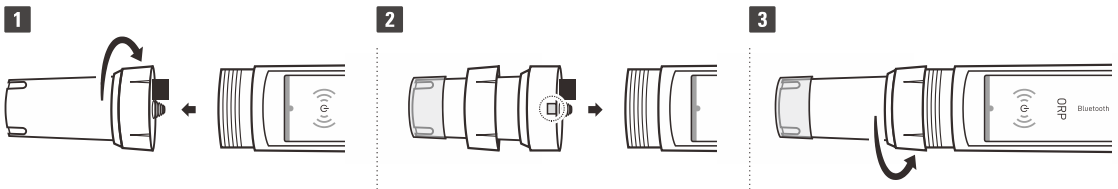
Electrode Maintenance and Replacement

- Rinse the platinum electrode thoroughly with distilled water after use.
- In the corrosive chemicals, viscous solutions and solutions with heavy metals or proteins, take readings quickly and rinse electrode immediately.
- If you do not use the tester for a period longer than 1 month, store the electrode in 4M KCl solution or electrode storage solution.

Replacing the ORP Electrode

If the tester fails to calibrate or gives fluctuating readings, you should consider replacing the electrode.

1. Twist the electrode collar counter clockwise, pull the electrode away from the tester.
2. Align the slot on the new electrode, gently push the electrode into the tester.
3. Twist the electrode collar clockwise until tight.



Appendix

Preparation of ORP Standard Solutions

Quinhydrone solution A:
Dissolve 3 grams of quinhydrone reagent in 500 ml of the pH 4.01 buffer solution, stir the solution for 10 minutes. Undissolved quinhydrone reagent must be present. If necessary, add the reagent.

Temperature	Potential (±10 mV)
20°C	268 mV
25°C	263 mV
30°C	260 mV

Quinhydrone solution B:
Dissolve 3 grams of quinhydrone reagent in 500 ml of the pH 7.00 buffer solution, stir the solution for 10 minutes. Undissolved quinhydrone reagent must be present. If necessary, add the reagent.

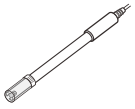
Temperature	Potential (±10 mV)
20°C	94 mV
25°C	87 mV
30°C	80 mV

⚠
Due to the quinhydrone solution is susceptible to air oxidation in storage, make sure to prepare the fresh solution before use.

Preparation of Electrode Storage Solution

1. Dissolve 29.8 grams of analytical grade potassium chloride (KCl) reagent in 100 ml distilled water.
2. Add pH 4.01 standard buffer and adjust solution to pH 4.

Optional Accessories

	Order Code	Description
	E-ORPscan-S	• General purpose ORP electrode, platinum sheet • For measuring the general water samples
	E-ORPscan-BNC	• BNC connector
	501	• General purpose ORP electrode, platinum pin, epoxy body, 12 mm (0.47 in.) diameter • For measuring the general water samples
	504	• General purpose ORP electrode, platinum ring, glass body, 12 mm (0.47 in.) diameter • For measuring the high temperature samples (< 100°C/212°F)

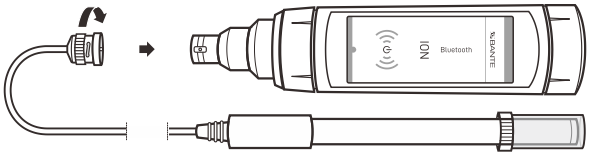
S30

Ion Calibration and Measurement

This section is applicable to model S30 tester

Prior to Use

1. Take out the ion selective electrode from the carrying case. Remove the protective cap and soak the electrode in 100 ppm standard solution for about 10 minutes.
2. Insert the BNC connector into the connector socket on tester, rotate and push the connector clockwise until it locks.
3. Tap the , tap the **Ion** to enter the measurement screen.



Ion Settings

The BanteLab app contains 5 ion settings and 9 general settings in the setup menu.

Menu Item	Option	Description	Default
Electrode Type	1	Set the electrode type and slope storage location.	1
	2		
	3		
Measurement Mode	Direct Reading	Set the ion measurement method.	Direct Reading
	Known Addition		
	Known Subtraction		
	Sample Addition		
	Sample Subtraction		
Concentration Unit	ppm	Set the measurement unit. The tester must be recalibrated if the concentration unit is changed from ppm (mg/L) to mol/L (mmol/L), the screen will always show "*Could not find the electrode slope*" and wait for calibration.	ppm
	mg/L		
	mol/L		
	mmol/L		
Calibration Points	2 to 5 points	Set the number of calibration points.	2 points
Alarm Limits	Enable	Set the high and low limit values to activate alarm.	Disable
	Disable		

To change the current settings, refer to the ***Setting the Default Option*** section on page 7.

Temperature Compensation

Due to the temperature difference between the standard and sample solutions will cause approximately 2% measurement error for every degree centigrade of temperature change, we recommend to enable the temperature compensation during the calibration and measurement.

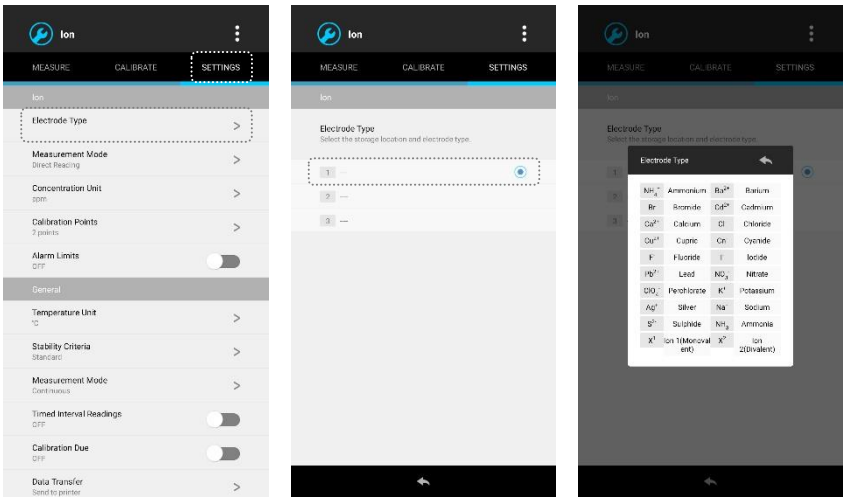
1. Use an accurate thermometer to measure the solution.
2. Tap the temperature reading on the measurement screen.
3. Tap the numeric keypad to enter the temperature.
4. Tap the **Done** to return to the measurement screen.

If the screen shows "*Could not find the electrode slope*", tap the **Exit**, then tap the temperature reading. When the setting is completed, the app will show the user entered temperature in the calibration screen.

Selecting the Electrode Type

The BanteLab app is able to save up to 3 electrode slopes in memory. For example, you select the electrode type 1 and use the fluoride electrode to calibrate the tester, select the electrode type 2 and use the chloride electrode to calibrate the tester. The electrode slopes will be saved in the selected location separately after the calibration. If you have not changed this option, the default will be 1, the electrode type shows "Ion".

1. Tap the **Settings**.
2. Tap the **Electrode Type**.
3. Tap the slope storage location **1** or 2, or 3, the screen will show an electrode type list.
4. Select the electrode type according to the connected sensor.
5. Tap the **Measure** to return to measurement screen.



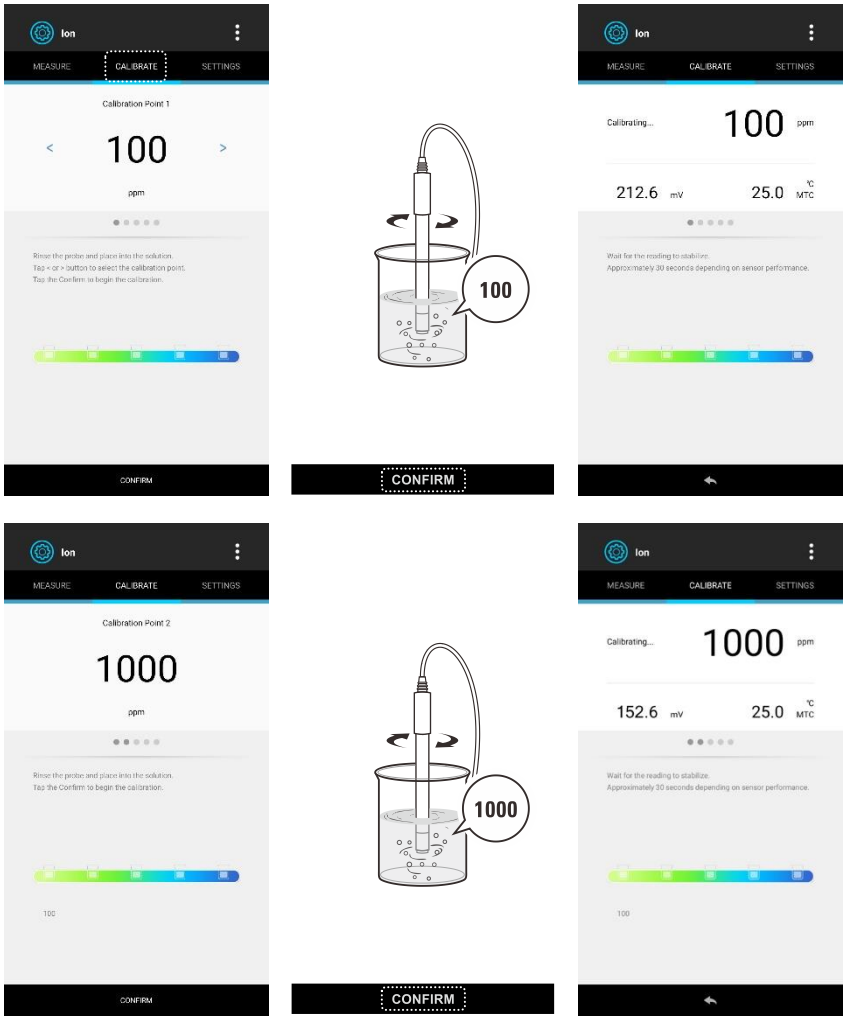
Ion Calibration

The S30 tester allows 2 to 5 points calibration in the ion mode, acceptable calibration points include the following options.

Measurement Unit	Calibration Points
ppm or mg/L	0.001, 0.01, 0.1, 1, 10, 100, 1000
mol/L	0.001, 0.01, 0.1, 1
mmol/L	0.001, 0.01, 0.1

Before beginning calibration, make sure that you have selected the corresponding electrode type in the setup menu. All of the standards and samples should be at the same temperature and calibration points cover the anticipated range of the samples.
For the low concentration or sample contains the interference ions, we recommend to add the ionic strength adjuster (ISA) to all of the standards and samples. A typical addition would be 2 ml ISA to 100 ml of standard and sample.
For the low level sodium determination (< 1 ppm), make sure to use the laboratory plastic beaker as a container.
Stir the standards and samples at a uniform rate that will help you get most accurate readings.

1.1 Tap the **Calibrate**, the screen shows "*Calibration Point 1, 100 ppm* ".
1.2 If necessary, tap the **<** or **>** to select first calibration point, the tester will perform the calibration from the low to high concentrations.
1.3 Rinse the electrode with distilled water and place into the standard solution, stir the electrode gently to create a homogeneous solution.
1.4 Wait for 5 seconds, tap the **Confirm** to begin the calibration.
1.5 When the reading has stabilized, the screen will show "*Calibration Point 2, 1000 ppm* ", the app prompts you to continue with second point calibration.
1.6 Repeat steps 1.3 and 1.4 above until the screen shows "*Calibration is completed* ".



To exit the calibration without saving changes, tap the **Measure**.

Viewing the Calibration Log

2.1 Tap the ⋮ .
2.2 Tap the **Calibration Report**.
2.3 Tap the ↩ to return to the measurement screen.

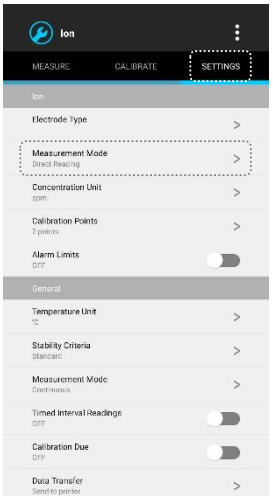
If the tester is not calibrated, the calibration report will show ---- only.

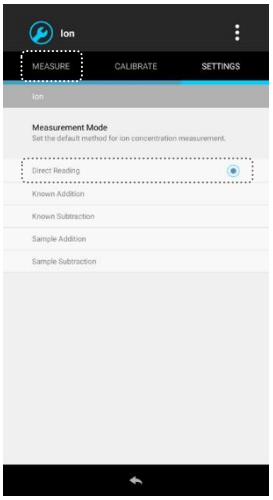
Measurements

The BanteLab app provides the 5 ion concentration measurement methods, including the direct reading, known addition, known subtraction, sample addition and sample subtraction. If you selected mol/L or mmol/L as the concentration unit, the incremental methods will be disabled, the screen will always show "*Could not find the electrode slope* ", the tester must be recalibrated in the concentration unit ppm or mg/L.

Selecting the Measurement Mode

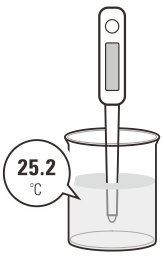
1.1 Tap the **Settings**.
1.2 Tap the **Measurement Mode** and select an option.
1.3 Tap the **Measure**.

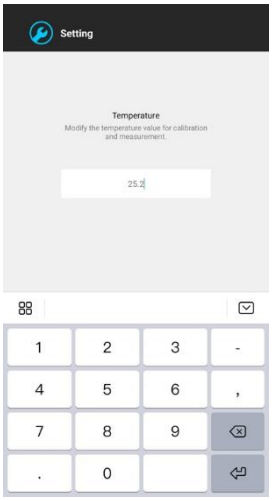




Direct Reading

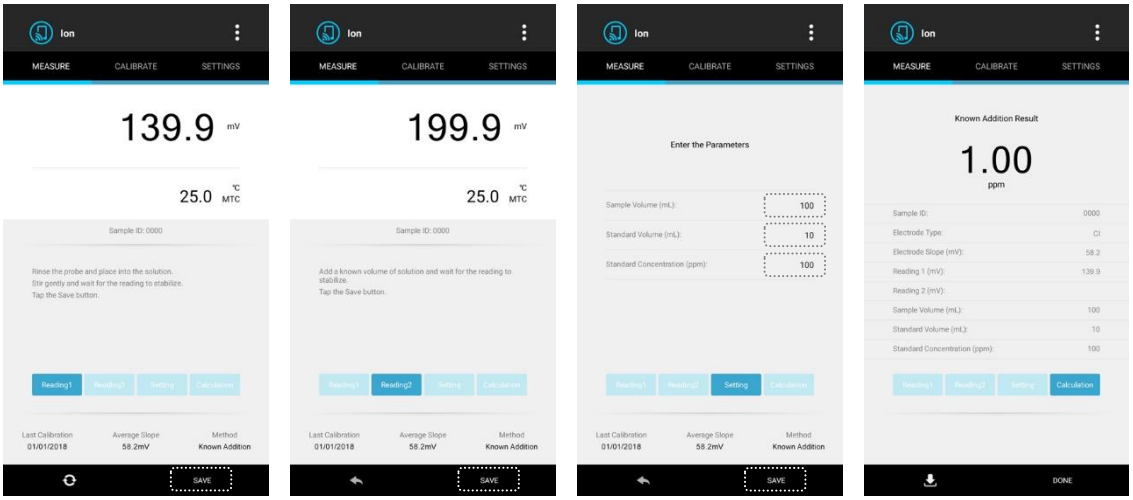
2.1 Ensure that you have selected the Direct Reading in setup menu.
2.2 Use a thermometer to measure the sample temperature. Tap the temperature reading on measurement screen and enter the temperature value.
2.3 Rinse the electrode with distilled water, place the electrode into the sample solution and stir gently. Wait for the measurement to stabilize and record the reading.





Known Addition

3.1 Ensure that you have selected the Known Addition in setup menu.
3.2 Rinse the electrode with distilled water, place the electrode in a known volume of sample solution and stir gently. Wait for the reading to stabilize, tap the **Save** to store reading 1.
3.3 Add a known volume of standard solution to the sample. Wait for the reading to stabilize, tap the **Save** to store reading 2.
3.4 Enter the sample volume, stand volume and standard concentration to parameter list, tap the **Save**, the app automatically calculates and shows the known addition result.
3.5 Tap the **Done**, the tester will take a new measurement.



Known Subtraction

The procedure for known subtraction is similar to the known addition method. The difference is that the standard solution does not contain the same ionic species that you are trying to measure in the sample. Instead, it contains an ion that will complex or precipitate the ion of interest, removing it from the sample.

4.1 Ensure that you have selected the Known Subtraction in setup menu.
4.2 Repeat steps 3.2 through 3.4 above until the screen shows the known subtraction result.

Sample Addition

This method is similar to the known addition method, except that the sample is added to the standard solution.

5.1 Ensure that you have selected the Sample Addition in setup menu.
5.2 Rinse the electrode with distilled water. Place the electrode in a known volume of standard solution and stir gently. Wait for the reading to stabilize, tap the **Save** to store reading 1.
5.3 Add a known volume of sample to the standard solution. Wait for the reading to stabilize, tap the **Save** to store reading 2.
5.4 Enter the sample volume, standard volume and standard concentration to parameter list, tap the **Save**, the app automatically calculates and shows the known addition result.
5.5 Tap the **Done**, the tester will take a new measurement.

Sample Subtraction

This method is similar to the known subtraction method, except that the sample is added to the standard solution.

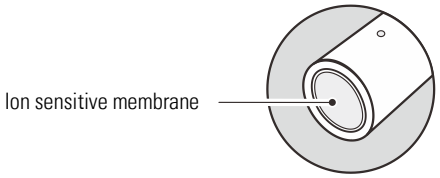
6.1 Ensure that you have selected the Sample Subtraction in setup menu.
6.2 Repeat steps 5.2 through 5.4 above until the screen shows the sample subtraction result.

mV

7.1 Tap the ↻ .
7.2 Tap the **mV**, the screen shows millivolt readings.

Electrode Maintenance

- Rinse the ion selective electrode thoroughly with distilled water after use, wipe clean with a lint-free tissue, then replace protective cap and store the electrode in a dry, cool and well-ventilated area.
- Never scratch the ion sensitive membrane on the bottom of the electrode.
- If the electrode response becomes sluggish, soak the electrode in 100 ppm standard solution for at least 1 hour.



Appendix

Preparation of Ion Standard Solution (1000 ppm)

1. Half fill a 1 liter volumetric flask with distilled water and add the analytical grade reagent according to the instructions in table below.

Ion Type	Reagent	Weight (grams)	Ion Type	Reagent	Weight (grams)
Ammonium	NH_4Cl	2.97	Iodide	NaI	1.18
Bromide	NaBr	1.29	Lead	$Pb(NO_3)_2$	1.60
Cadmium	$Cd(NO_3)_2 \bullet 4H_2O$	2.74	Nitrate	$NaNO_3$	1.37
Calcium	$CaCl_2 \bullet 2(H_2O)$	3.67	Potassium	KCl	1.91
Chloride	NaCl	1.65	Silver	$AgNO_3$	1.57
Cupric	$Cu(NO_3)_2 \bullet 3H_2O$	3.80	Sodium	NaCl	2.54
Cyanide	NaCN	1.88	Sulfide	$Na_2S \bullet 9H_2O$	7.49
Fluoride	NaF	2.21	Ammonia	NH_4Cl	3.15

2. Swirl the volumetric flask gently to dissolve the reagent and fill to the mark with distilled water.
3. Cap and upend the volumetric flask several times to mix the solution.

Optional Accessories

Ion Selective Electrodes

Order Code	Description	Range (ppm)	Order Code	Description	Range (ppm)
ISE-NH4	Ammonium (NH_4^+)	0.1 to 18000	ISE-I	Iodide (I^-)	0.06 to 127000
ISE-Br	Bromide (Br^-)	0.4 to 81000	ISE-Pb	Lead (Pb^{2+})	0.2 to 20800
ISE-Cd	Cadmium (Cd^{2+})	0.1 to 11200	ISE-NO3	Nitrate (NO_3^-)	0.4 to 62000
ISE-Ca	Calcium (Ca^{2+})	0.02 to 40100	ISE-K	Potassium (K^+)	0.04 to 39000
ISE-Cl	Chloride (Cl^-)	1 to 35000	ISE-Ag	Silver (Ag^+)	0.01 to 107900
ISE-Cu	Cupric (Cu^{2+})	0.06 to 6400	ISE-Na	Sodium (Na^+)	0.002 to 69000
ISE-CN	Cyanide (CN^-)	0.03 to 260	ISE-S	Sulfide (S^{2-})	0.003 to 32000
ISE-F	Fluoride (F^-)	0.02 to 1900	ISE-NH3	Ammonia (NH_3)	0.01 to 17000

Standard Solutions

Order Code	Description	Volume (ml)	Order Code	Description	Volume (ml)
ION-NH4	1000 ppm ammonium	480	ION-I	1000 ppm iodide	480
ION-Br	1000 ppm bromide	480	ION-Pb	1000 ppm lead	480
ION-Cd	1000 ppm cadmium	480	ION-NO3	1000 ppm nitrate	480
ION-Ca	1000 ppm calcium	480	ION-K	1000 ppm potassium	480
ION-Cl	1000 ppm chloride	480	ION-Ag	1000 ppm silver	480
ION-Cu	1000 ppm cupric	480	ION-Na	1000 ppm sodium	480
ION-F	1000 ppm fluoride	480			

Ionic Strength Adjusters

Order Code	Description	Volume (ml)	Order Code	Description	Volume (ml)
ISA-NH4	Ammonium (NH_4^+)	480	ISA-I	Iodide (I^-)	480
ISA-Br	Bromide (Br^-)	480	ISA-Pb	Lead (Pb^{2+})	480
ISA-Cd	Cadmium (Cd^{2+})	480	ISA-NO3	Nitrate (NO_3^-)	480
ISA-Ca	Calcium (Ca^{2+})	480	ISA-K	Potassium (K^+)	480
ISA-Cl	Chloride (Cl^-)	480	ISA-Ag	Silver (Ag^+)	480
ISA-Cu	Cupric (Cu^{2+})	480	ISA-Na	Sodium (Na^+)	480
ISA-CN	Cyanide (CN^-)	480	ISA-NH3	Ammonia (NH_3)	480
ISA-F	Fluoride (F^-)	480			

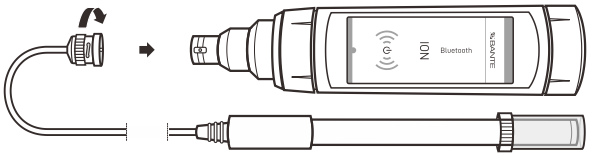
S40

Water Hardness Calibration and Measurement

This section is applicable to model S40 tester

Prior to Use

1. Take out the water hardness electrode from the carrying case. Remove the protective cap and soak the electrode in 10 mmol/L standard solution for about 10 minutes.
2. Insert the BNC connector into the connector socket on tester, rotate and push the connector clockwise until it locks.
3. Tap the ↻ , tap the **Water Hardness** to enter the measurement screen.



Water Hardness Settings

The BanteLab app contains 3 water hardness settings and 9 general settings in the setup menu.

Menu Item	Option	Description	Default
Measurement Unit	°dH	Set the water hardness unit. • °dH = German degree • °e = English degree • °fH = French degree • gpg = Grains per gallon	°dH
	°e		
	°fH		
	gpg		
	mg/L ($CaCO_3$)		
	mg/L (CaO)		
	mg/L (Ca^{2+})		
	mmol/L		
Calibration Points	2 to 5 points	Set the number of calibration points.	2 points
Alarm Limits	Enable	Set the high and low limit values to activate alarm.	Disable
	Disable		

ⓘ To change the current settings, refer to the ***Setting the Default Option*** section on page 7.

Temperature Compensation

In order to get accurate measurement results, we recommend that all of the standard and sample solutions should be at the same temperature. If you want to enable the manual temperature compensation, please follow the steps below.

1. Use an accurate thermometer to measure the solution.
2. Tap the temperature reading on the measurement screen.
3. Tap the numeric keypad to enter the temperature.
4. Tap the **Done** to return to the measurement screen.

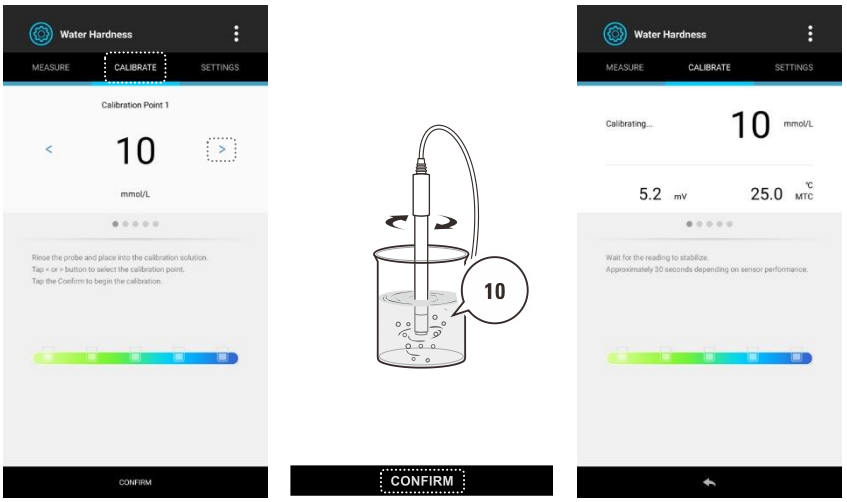
ⓘ

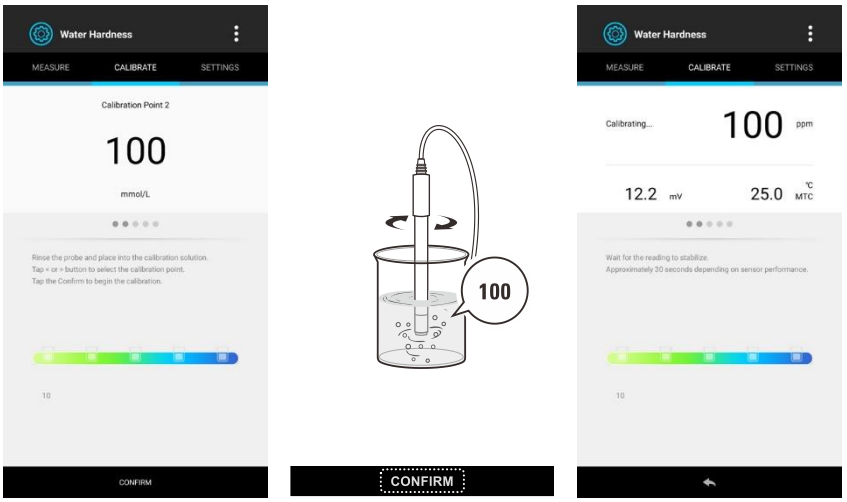
If the screen shows "*Could not find the electrode slope* ", tap the **Exit**, then tap the temperature reading. When the setting is completed, the app will show the user entered temperature in the calibration screen.

Water Hardness Calibration

The S40 tester allows 2 to 5 points calibration in the water hardness mode, acceptable calibration points include the 0.001, 0.01, 0.1, 0.1, 1, 10 and 100 mmol/L. For better accuracy, we recommend to add the ionic strength adjuster (ISA) to all standard and sample solutions and selected calibration points cover anticipated range of the sample. A typical addition would be 2 ml ISA to 100 ml of standard and sample.

1.1 Tap the **Calibrate**, the screen shows "*Calibration Point 1, 0.01 mmol/L* ".
1.2 If necessary, tap the **<** or **>** to select first calibration point, the tester will perform the calibration from the low to high concentrations.
1.3 Rinse the electrode with distilled water and place into the standard solution, stir the electrode gently to create a homogeneous solution.
1.4 Wait for 5 seconds, tap the **Confirm** to begin the calibration.
1.5 When the reading has stabilized, the screen will show "*Calibration Point 2, 0.1 mmol/L* ", the app prompts you to continue with second point calibration.
1.6 Repeat steps 1.3 and 1.4 above until the screen shows "*Calibration is completed* ".





To exit the calibration without saving changes, tap the **Measure**.

Viewing the Calibration Log

2.1 Tap the ⋮ .
2.2 Tap the **Calibration Report**.
2.3 Tap the ↩ to return to the measurement screen.

If the tester is not calibrated, the calibration report will show ---- only.

Measurements

Water Hardness

1.1 Use a thermometer to measure the sample temperature. Tap the temperature reading on measurement screen and enter the temperature value.
1.2 Rinse the electrode with distilled water, place the electrode into the sample solution and stir gently. Wait for the measurement to stabilize and record the reading.

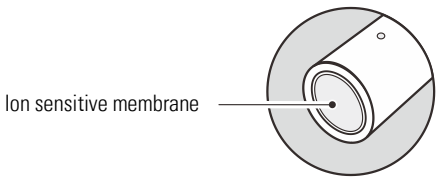
If the Auto-Read option is enabled in the setup menu, the app will automatically lock a measurement endpoint and show HOLD icon. Tap the 🔒 to resume measuring.

mV

2.1 Tap the ⟳ .
2.2 Tap the **mV**, the screen shows millivolt readings.

Electrode Maintenance

- Rinse the water hardness electrode thoroughly with distilled water after use, wipe clean with a lint-free tissue, then replace protective cap and store the electrode in a dry, cool and well-ventilated area.
- Never scratch the ion sensitive membrane on the bottom of the electrode.
- If the electrode response becomes sluggish, soak the electrode in 10 mmol/L standard solution for at least 1 hour.



Appendix

Preparation of Water Hardness Standard Solution (100 mmol/L)

1. To half fill a 1 liter volumetric flask with distilled water and add 14.7 grams of analytical grade calcium chloride ($CaCl_2 \bullet 2H_2O$) reagent.
2. Swirl the volumetric flask gently to dissolve the reagent and fill to the mark with distilled water.
3. Cap the and upend volumetric flask several times to mix the solution.

Optional Accessories

Order Code	Description
ISE-WH	Water hardness electrode, range: 0.05 to 200 mmol/L
ION-WH	100 mmol/L standard solution, 480 ml
ISA-WH	Ionic strength adjuster, 480 ml

S50

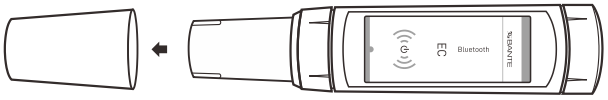
Conductivity/TDS/Salinity/Resistivity/Conductivity Ash

Calibration and Measurement

This section is applicable to model S50 tester

Prior to Use

1. Remove the protective cap from the bottom of the tester. Soak the electrode for about 10 minutes in tap water to remove dirt and oil stains on the sensor surface.
2. Tap the ↻ , tap the **Conductivity** to enter the measurement screen.



Conductivity cell

Conductivity/TDS/Salinity Settings

The BanteLab app contains 7 conductivity settings, 1 TDS setting, 1 salinity setting and 9 general settings in the setup menu.

Menu Item	Option	Description	Default
Cell Constant	2-cell (K=0.1)	Set the cell constant to match the connected electrode.	Model S50-M: 2-cell (K=1) Model S50-H: 2-cell (K=10)
	2-cell (K=1)		
	2-cell (K=10)		
	4-cell		
Calibration Points	1 to 3 points	Set the number of calibration points.	3 points
Temperature Compensation	Linear	Set the temperature compensation type.	Linear
	Non-linear		
	USP		
	EP (Highly purified Water)		
	EP (Purified Water)		
Temperature Coefficient	0.0 to 10.0%/°C	Set the linear temperature compensation coefficient.	2.10%/°C
Pure Water Coefficient	Enable	Set the pure water coefficient for ultra-pure water measurement.	Disable
	Disable		
Reference Temperature	20°C	Set the normalization temperature for measurement, the readings will automatically compensate to the selected temperature during measurement.	25°C
	25°C		
Alarm Limits	Enable	Set the high and low limit values to activate alarm.	Disable
	Disable		
TDS Factor	0.01 to 1.00	Set the TDS conversion factor.	0.50
Salinity type	Practical Salinity (PSU)	Set the salinity measurement unit.	PSU
	Seawater (ppt)		
	Percentage (%)		
Measurement Method	Refined Sugar	Set the measurement method for conductivity ash.	Refined Sugar
	Raw Sugar		

i To change the current settings, refer to the ***Setting the Default Option*** section on page 7.

The BanteLab app contains 5 temperature compensation options in conductivity mode, the linear compensation is appropriate for most samples. If your sample is natural water (e.g., natural ground, well, or surface waters), using the non-linear compensation is necessary. Note, the non-linear compensation can only be performed at temperature range from 0°C to 36°C (32°F to 96.8°F). If the sample temperature is out of above range, the screen will show a warning.

Conductivity Calibration

The S50 tester allows 1 to 3 points calibration in the conductivity mode, we recommend that you perform 3 points calibration or select a standard solution closest to the sample conductivity you are measuring. The tester will automatically detect the standard solution and prompt the user to perform the calibration. When the calibration is completed, all new calibration values will automatically override existing data.

The following table shows acceptable standard solutions for each tester.

Model	Measurement Range	Standard Solution Range	Default
S50-M	0 to 200 µS/cm	70 to 170 µS/cm	84 µS/cm
S50-M/S50-H	200 to 2000 µS/cm	700 to 1700 µS/cm	1413 µS/cm
S50-M/S50-H	2 to 20 mS/cm	7 to 17 mS/cm	12.88 mS/cm
S50-H	20 to 200 mS/cm	70 to 170 mS/cm	111.8 mS/cm

Make sure to use the fresh standard solution during the calibration. DO NOT reuse the standard solution after calibration, contaminants in solution will affect the calibration and eventually the accuracy of the measurement.

Single Point Calibration

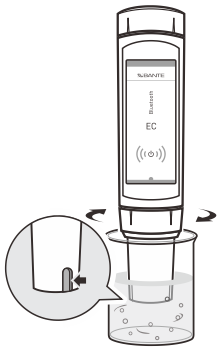
Ensure that you have selected 1 point calibration in the setup menu.

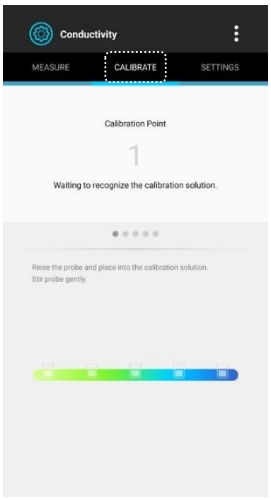
1.1 Rinse the electrode with distilled water and place into the standard solution, stir tester gently to remove air bubbles trapped in the slot of the sensor.

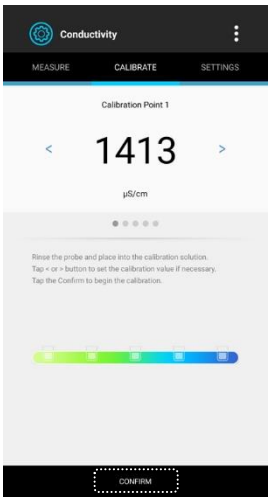
1.2 Tap the **Calibrate**. The screen shows "*Calibration Point 1*", the tester automatically recognizes the standard solution and shows the calibration standard.

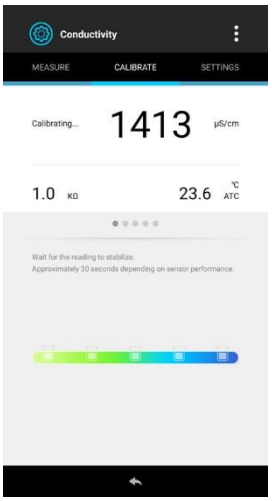
1.3 If necessary, tap the **<** or **>** to modify the calibration value.

1.4 Wait for 5 seconds. Tap the **Confirm**, the tester begin the calibration. When the reading has stabilized, the screen will show "*Calibration is completed*".









Multipoint Calibration

Ensure that you have selected 2 or 3 points calibration in the setup menu.

2.1 Repeat steps 1.1 through 1.4 above. When the first calibration point is completed, the display will show "*Calibration Point 2* ", the app prompts you to continue with second point calibration.

2.2 Rinse the electrode with distilled water and place into the standard solution, stir tester gently.

2.3 Wait for 5 seconds. Tap the **Confirm**, the tester begin the calibration. When the reading has stabilized, the screen will show "*Calibration Point 3*", the app prompts you to continue with third point calibration. Repeat steps 2.2 and 2.3 until the screen shows "*Calibration is completed*".

- Performing the conductivity calibration will simultaneously calibrate the corresponding TDS, salinity, resistivity and conductivity ash values.
- To exit the calibration without saving changes, tap the **Measure**.

Viewing the Calibration Log

3.1 Tap the ⋮ .

3.2 Tap the **Calibration Report**.

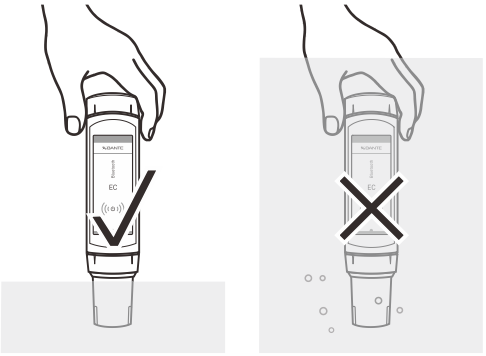
3.3 Tap the ↩ to return to the measurement screen.

If the tester is not calibrated, the calibration report will show ---- only.

Measurements

Conductivity/TDS/Salinity/Resistivity

1. Tap the ↻ and select a measurement mode.
2. Rinse the electrode with distilled water. Place the electrode into the sample solution and stir gently. Note, DO NOT completely immerse the tester in water. Wait for the measurement to stabilize and record the reading.



If the Auto-Read option is enabled in the setup menu, the app will automatically lock a measurement endpoint and show HOLD icon. Tap the 🔒 to resume measuring.

Conductivity Ash

1. Prepare the sugar sample according to the ICUMSA GS2/3-17 or ICUMSA GS1/3/4/7/8-13 method.
2. Tap the ↻ and select the **Conductivity Ash** measurement mode.
3. Tap the **Settings** and tap the **Conductivity of Used Water** to set the conductivity of the used water for preparing sugar solutions (range: 0.00 to 100.0 µS/cm).
4. Rinse the electrode with distilled water and place into the sample solution, stir tester gently.
5. Tap the **Measure**. Wait for the measurement to stabilize and record the reading.

Note, the conductivity ash measurement can only be performed at temperature range from 15°C to 25°C (59°F to 77°F). If the temperature reading is out of above range, the screen will show a warning.

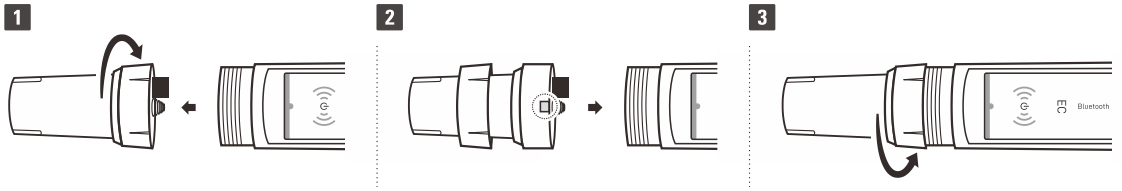
Electrode Maintenance and Replacement

- Rinse the conductivity electrode thoroughly with distilled water after use.
- Do not touch the platinum black coating on the sensor surface and always keep it clean.
- If there is a build-up of solids inside the sensor, remove carefully, then recalibrate the tester.
- If you do not use the tester for long periods, remove the batteries.

Replacing the Conductivity Electrode

If the tester fails to calibrate or gives fluctuating readings, you should consider replacing the electrode.

1. Twist the electrode collar counter clockwise, pull the electrode away from the tester.
2. Align the slot on the new electrode, gently push the electrode into the tester.
3. Twist the electrode collar clockwise until tight.



Appendix

Preparation of Conductivity Standard Solutions

1. Place the analytical grade potassium chloride (KCl) reagent in a beaker and dry in an oven for about 3 hours at 105°C (221°F), then cool to room temperature.
2. Add the reagent to a 1 liter volumetric flask according to the instructions in table below.

Conductivity Standard	Reagent	Weight
84 µS/cm	KCl	42.35 mg
1413 µS/cm	KCl	745.5 mg
12.88 mS/cm	KCl	7.45 g
111.8 mS/cm	KCl	74.5 g

3. Fill the distilled water to the mark, mix the solution until the reagent is completely dissolved.

Calculating the Temperature Coefficient

1. Tap the ↻ , tap **Conductivity**, tap the **Settings**.
2. Tap **Temperature Coefficient** and set the value to 0.
3. Place the electrode into the sample solution, record the temperature value T_A and conductivity value C_{TA}.
4. Condition the sample solution and electrode to a temperature T_B that is about 5°C to 10°C different from T_A. Record the conductivity value C_{TB}.
5. Calculate the temperature coefficient using the following formula.

$$T_c = \frac{C_{TB} - C_{TA}}{C_{TA}(T_B - 25) - C_{TB}(T_A - 25)}$$

Where:
T_C = Temperature coefficient
C_{TA} = Conductivity at Temperature A
C_{TB} = Conductivity at Temperature B
T_A = Temperature A
T_B = Temperature B

Calculating the TDS Conversion Factor

$$\text{Factor} = \frac{\text{Actual TDS}}{\text{Actual Conductivity @25°C}}$$

Where:
Actual TDS = Value from the high purity water and precisely weighed NaCl or KCl reagent
Actual Conductivity = The tester measured conductivity value

For example:
Dissolve 64 grams of the potassium chloride (KCl) reagent in 1 liter distilled water. If measured conductivity is 100 mS/cm, then TDS factor is 0.64.

Conductivity to TDS Conversion Factors

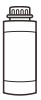
Conductivity at 25°C	TDS (KCl)		TDS (NaCl)	
	ppm	Factor	ppm	Factor
84 µS/cm	40.38	0.5048	38.04	0.4755
1413 µS/cm	744.7	0.527	702.1	0.4969
12.88 mS/cm	7447	0.5782	7230	0.5613

Optional Accessories

Conductivity Electrodes

	Order Code	Description
	E-ECscan-**C1**-10K	• Platinum cell constant, K=1 • Measuring range 10 to 20 mS/cm
	E-ECscan-**C10**-10K	• Platinum cell constant, K=10 • Measuring range 0.1 to 200 mS/cm

Solutions

	Order Code	Description
	ECCS-84	Standard solution 84 µS/cm, 480 ml
	ECCS-1413	Standard solution 1413 µS/cm, 480 ml
	ECCS-1288	Standard solution 12.88 mS/cm, 480 ml
	ECCS-50	Standard solution 50 mS/cm, 480 ml
	ECCS-1118	Standard solution 111.8 mS/cm, 480 ml

S60

Dissolved Oxygen/BOD/OUR/SOUR

Calibration and Measurement

This section is applicable to model S60 tester

Prior to Use

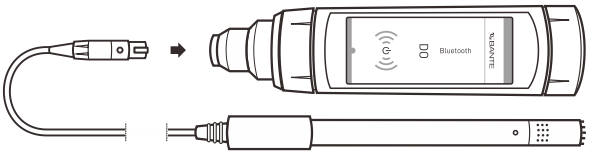
Tap the ⟳ , tap the **Dissolved Oxygen** to enter the measurement screen.

Filling the Electrolyte Solution

1. Take out the dissolved oxygen electrode from the carrying case. Unscrew the membrane cap from the bottom of the electrode, rinse the inside and outside with distilled water and blot dry.
2. Fill the membrane cap halfway with electrolyte solution.
3. Screw membrane cap back onto the electrode. Some electrolyte solution will overflow during this process.
4. Check the electrode, make sure that no air bubbles are trapped in the electrolyte solution and membrane is not creased or damaged.

Polarizing the Electrode

Insert the 6-pin connector into the connector socket on tester, make sure that the connector is fully seated.



Dissolved Oxygen Settings

The BanteLab app contains 6 dissolved oxygen settings and 9 general settings in the setup menu.

Menu Item	Option	Description	Default
Measurement Unit	mg/L	Set the measurement unit.	mg/L
	%		
Calibration Points	1 or 2 points	Set the number of calibration points.	1 point
Resolution	0.01	Set the resolution of dissolved oxygen measurement.	0.01
	0.1		
Barometric Pressure	450 to 850 mmHg	Set the barometric pressure coefficient according to the local altitude (refer to Table 1).	760 mmHg
	60.0 to 113.3 kPa		
Salinity Coefficient	0.0 to 50.0 ppt	Set the salinity compensation coefficient of sample.	0.0 ppt
Alarm Limits	Enable	Set the high and low limit values to activate alarm.	Disable
	Disable		

- The following table describes the relationship between the altitude and barometric pressure. Make sure to set the compatible parameter before the calibration and measurement.
- To change the current settings, refer to the ***Setting the Default Option*** section on page 7.

Table 1. Altitude and Barometric Pressure

Altitude (m)	kPa	mmHg	Altitude (m)	kPa	mmHg
0	101.3	760	1800	80.9	607
100	100.1	750	1900	79.9	599
200	98.8	741	2000	78.9	592
300	97.6	732	2100	77.9	584
400	96.4	723	2200	76.9	577
500	95.2	714	2300	76.0	570
600	94.0	705	2400	75.0	563
700	92.8	696	2500	74.1	556
800	91.7	688	2600	73.2	549
900	90.5	679	2700	72.3	542
1000	89.4	671	2800	71.4	536
1100	88.3	662	2900	70.5	529
1200	87.2	654	3000	69.6	522
1300	86.1	646	3100	68.7	515
1400	85.0	638	3200	67.9	509
1500	84.0	630	3300	67.0	502
1600	82.9	622	3400	66.2	496
1700	81.9	614	3500	65.4	490

Dissolved Oxygen Calibration

The S60 tester allows 1 or 2 points calibration. If you have selected the 1 point calibration in the setup menu, we recommend that you perform a 100% saturation calibration or dissolved oxygen concentration calibration in the air-saturated water. If the 2 points calibration is selected, the zero oxygen solution needs to be used.

During the calibration and measurement, the temperature sensor on electrode must be immersed in the sample solution completely, the solution should keep 0.3 m/s of minimum flow rate to avoid oxygen starvation at the membrane.

Temperature sensor

DO Calibration in mg/L Mode

Ensure that you have selected the measurement unit mg/L and 1 point calibration in the setup menu.

1.1 Tap the **Calibrate**, the screen shows "*Calibration Point 1, 8.26 mg/L* ".

1.2 Place the electrode into the air-saturated water for 10 minutes and stir gently. Tap the **Confirm** to begin the calibration.

1.3 When the reading has stabilized, the screen will show "*Calibration is completed* ".

2 Points Calibration

Ensure that you have selected the 2 points calibration in the setup menu.

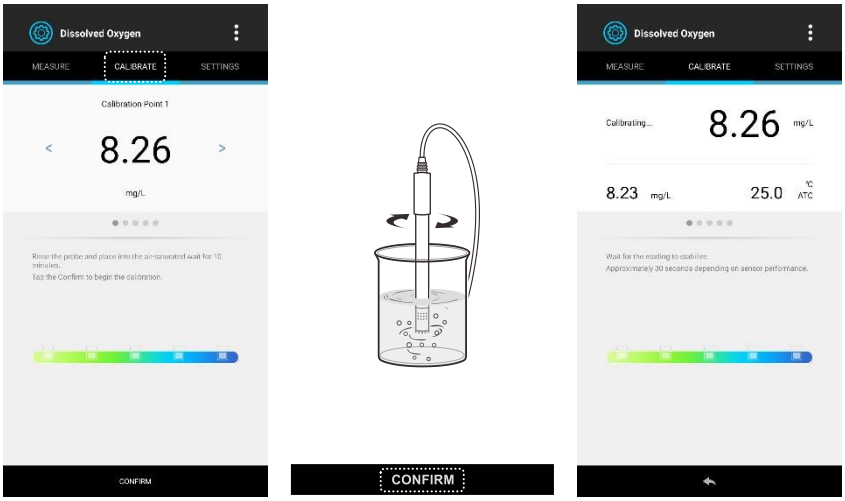
2.1 Tap the **Calibrate** and tap the **<** or **>** until the screen shows "*Calibration Point 1, 0.00 mg/L* ".

2.2 Place the electrode into the zero oxygen solution for 10 minutes and stir gently. Tap the **Confirm** to begin the calibration.

2.3 When the reading has stabilized, the screen will show "*Calibration Point 2, 8.26 mg/L* " . The app prompts you to continue with second point calibration.

2.4 Place the electrode into the air-saturated water for 10 minutes and stir gently. Tap the **Confirm**.

2.5 When the reading has stabilized, the screen will show "*Calibration is completed* ".



DO Calibration in % Saturation Mode

Ensure that you have selected the measurement unit % and 1 point calibration in the setup menu.

3.1 Tap the **Calibrate**, the screen shows "*Calibration Point 1, 100.0%* ".

3.2 Hold the dissolved oxygen electrode in the air at 100% relative humidity or place the electrode into the air-saturated water for about 10 minutes. Tap the **Confirm** to begin the calibration.

3.3 When the reading has stabilized, the screen will show "*Calibration is completed* ".

2 Points Calibration

Ensure that you have selected the 2 points calibration in the setup menu.

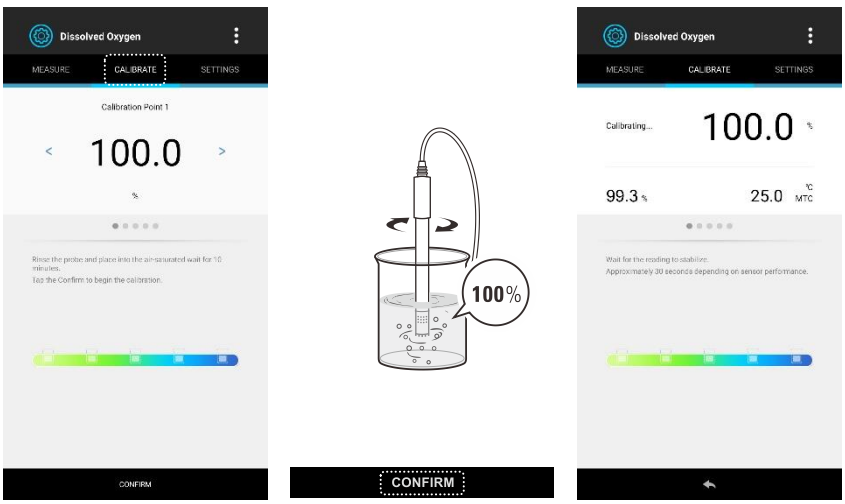
4.1 Tap the **Calibrate** and tap the **<** or **>** until the screen shows "*Calibration Point 1, 0.0%* ".

4.2 Place the electrode into the zero oxygen solution for 10 minutes and stir gently. Tap the **Confirm** to begin the calibration.

4.3 When the reading has stabilized, the screen will show "*Calibration Point 2, 100.0%* ". The app prompts you to continue with second point calibration.

4.4 Place the electrode into the air-saturated water for 10 minutes and stir gently. Tap the **Confirm**.

4.5 When the reading has stabilized, the screen will show "*Calibration is completed* ".



Viewing the Calibration Log

2.1 Tap the ⋮ .
2.2 Tap the **Calibration Report**.
2.3 Tap the ↩ to return to the measurement screen.

ⓘ If the tester is not calibrated, the calibration report will show ---- only.

Measurements

Dissolved Oxygen

The S60 tester can be used to measure the water, wastewater, brine and other liquids. If your sample is seawater or water containing large amounts of salt, make sure to set the salinity coefficient before measurement. Some gas and steam such as chloride, sulfur dioxide, sulfureted hydrogen and carbon dioxide can permeate the membrane via diffusion. Their existence will influence the measurements. If the sample contains solvent, grease, sulfide and alga, the membrane will be damaged or eroded.

1. If necessary, set the barometric pressure and salinity coefficient in the setup menu.
2. Rinse the electrode with distilled water, place the electrode into the sample solution and stir gently. Wait for the measurement to stabilize and record the reading.

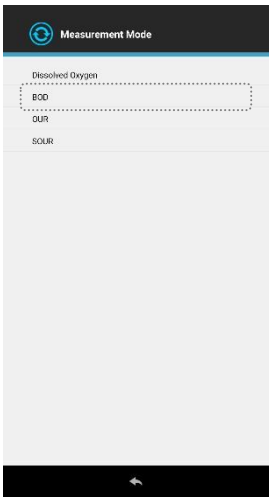
ⓘ If the Auto-Read option is enabled in the setup menu, the app will automatically lock a measurement endpoint and show HOLD icon. Tap the 🔒 to resume measuring.

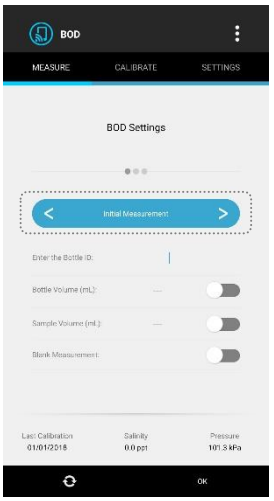
BOD

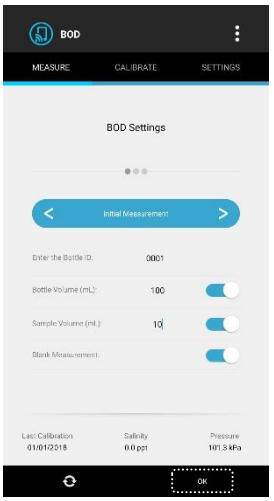
The BanteLab app contains a BOD measurement mode. A typical process for BOD determination consists of 4 steps: Sample preparation, initial measurement, incubation, final measurement.

Initial Measurement

1.1 Rinse the electrode with distilled water.
1.2 Tap the ⟳ , tap the **BOD**.
1.3 Tap the **<** or **>** to select the "Initial measurement".
1.4 Tap the **Enter the Bottle ID** and set a 4-digit number.
1.5 If necessary, turn on the **Bottle Volume** and **Sample Volume** options and enter the values. If the blank solution need to be measured, turn on the **Blank Measurement** option as well.
1.6 Tap the **OK** to begin the measurement.



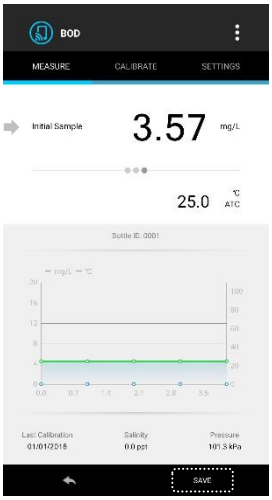




1.7 If the Blank Measurement option is turned on, the "*Initial Blank* " indicator will show on the top left of the screen. Place the electrode in the blank solution and stir gently, wait for the measurement to stabilize. Tap the **Save**, the app will automatically switch to the Initial Sample measurement screen.
If the Blank Measurement option is turned off, the "*Initial Sample* " indicator will show on the screen. Place the electrode in the sample solution and stir gently, wait for the measurement to stabilize. Tap the **Save** to store the reading. Measurement is completed.

Blank solution

Sample solution



Final Measurement

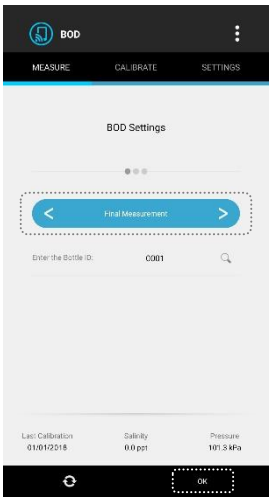
2.1 Tap the **<** or **>** to select the "Final measurement".

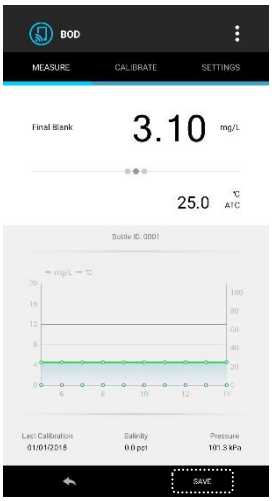
2.2 Tap and **Enter the bottle ID** (e.g., 0001).

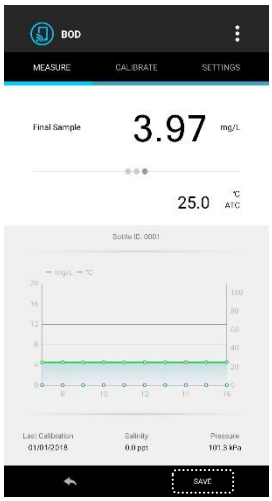
2.3 Tap the **OK**.

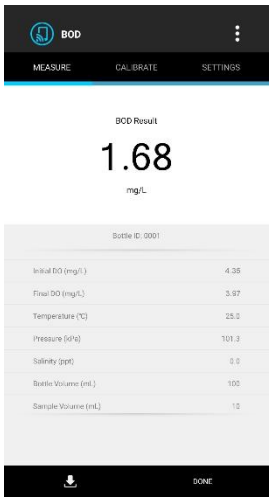
2.4 If the "*Final Blank* " indicator shows on the top left of the screen. Place the electrode in the blank solution and stir gently, wait for the measurement to stabilize. Tap the **Save**, the app will automatically switch to the Final Sample measurement screen.
If the "*Final Sample* " indicator shows on the top left of the screen. Place the electrode in the sample solution and stir gently, wait for the measurement to stabilize. Tap the **Save**, the screen will show the BOD result.

2.5 Tap the **Done**, the tester will take a new measurement.



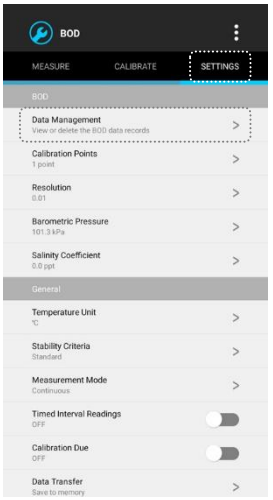


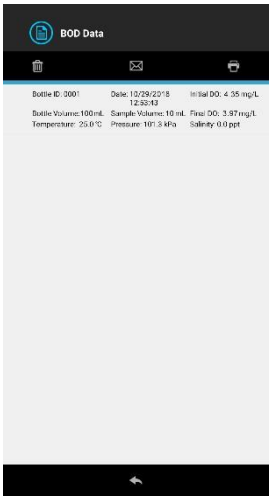




Viewing the BOD Data

The BanteLab app will automatically save the BOD data into the memory when the measurement is completed. Tap the **Settings** and tap the **Data Management**, the screen will show details.





OUR/SOUR

The BanteLab app contains a function for the calculations of Oxygen Uptake Rate (OUR) and Specific Oxygen Uptake Rate (SOUR). If the SOUR measurement is selected, the app will automatically calculate the reading and reference to 20°C (68°F). Note that this calculation is only valid for temperature ranges from 10°C to 30°C (50°F to 86°F). If the sample temperature is out of this range, the screen will show a warning.

Setting the Parameters

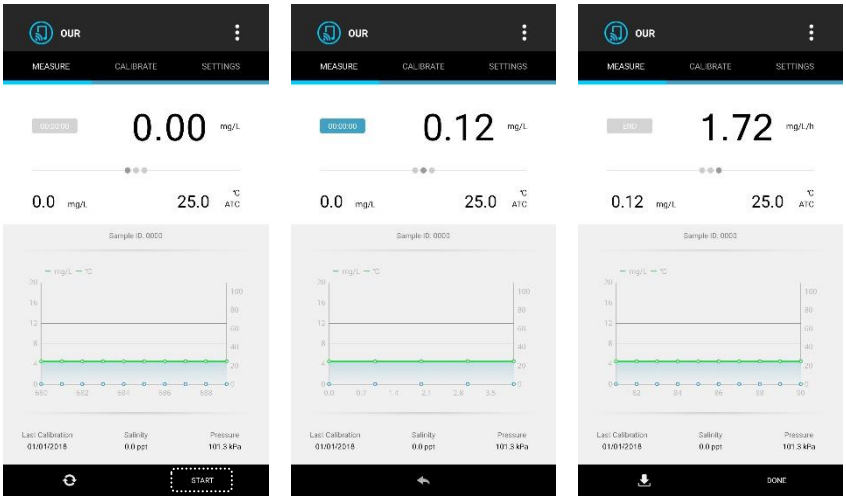
Ensure that the OUR or SOUR parameters have been set to desired values.

Measurement Mode	Parameter	Description
OUR/SOUR	Sample Volume (mL)	Set the sample volume.
	Total Volume (mL)	Set the total volume.
	Minimum Testing Time (minutes)	Set the minimum time of measurement. When the minimum time is reached, the measurement will start.
	Maximum Testing Time (minutes)	Set the maximum time of measurement. When the maximum time is reached, the measurement will end.
	Minimum Beginning DO (mg/L)	Set the minimum dissolved oxygen value allowed at the start of the measurement.
	Minimum Ending DO (mg/L)	Set the minimum dissolved oxygen value allowed during the measurement. If the measured value falls below this value, the measurement will end.
SOUR	Solids weight (g/L)	Set the total solids or volatile suspended solids concentration of the sample.

1.1 Tap the **Settings**.
1.2 Tap **OUR** or **SOUR parameters**.
1.3 Tap the parameter bar and enter the value.
1.4 Tap the **Measure** to return to the measurement screen.

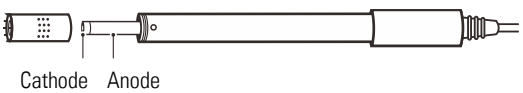
Measurement

2.1 Place the electrode in the sample solution and stir gently.
2.2 Tap the **Start**, the screen shows the dissolved oxygen readings.
2.3 When the maximum time is reached, the screen automatically shows "*End*" and calculated result.
2.4 Tap the **Done**, the tester will take a new measurement.



Electrode Maintenance

- Rinse the dissolved oxygen electrode thoroughly with distilled water after use.
- Do not touch the membrane and always keep it is clean and wet.
- If you do not use the electrode for long periods, screw off the membrane cap, rinse the electrode anode, cathode, membrane cap with distilled water and blot dry. Install the electrode and store dry.



Appendix

Preparation of Air-Saturated Water

Use an air-pump to blow air into distilled water at least 1 hour, while stirring the solution.

Preparation of Zero Oxygen Solution

Dissolve 500 mg of the sodium sulfate (Na_2SO_3) reagent and a small amount of cobalt (II) chloride hexahydrate ($CoCl_2 \cdot 6H_2O$) in the 250 ml distilled water, mix the solution until reagent is completely dissolved.

Optional Accessories

Order Code	Description
DO100	Polarographic dissolved oxygen electrode, epoxy body, 12 mm (0.47 in.) diameter, range: 0 to 20 mg/L
DO-MEM	Membrane cap, 2 PCS/set
DO-ES	Electrolyte solution, 30 ml

Specifications and Troubleshooting

This section is applicable to all models of the S series testers

Troubleshooting Guide

Fault	Solution
The tester turns off automatically after about 1 minute	The batteries are depleted, replace the batteries.
The tester can not connect to app	• Tap the sensor ID and wait until the icon appears, then connect the next sensor. • The pH, ORP, ion and water hardness testers can not connect to app simultaneously. • The batteries are depleted, replace the batteries.
The tester has connected to app, but the screen shows an incorrect measurement mode	Tap the and select the correct measurement mode.
Calibration error	Check the electrode and recalibrate the tester with fresh standard solutions.
Standard solution does not meet criteria	Check the pH electrode and make sure that the standard solutions should be at least 1 pH unit apart from each other.
Electrode slope is out of range	Recalibrate the tester with fresh standard solutions. If the electrode slope still out of the range, replace the electrode.
In the ion or water hardness modes, the screen shows "Could not find the electrode slope"	Make sure that selected the measurement unit and ion type are same as the calibration. Recalibrate the tester with fresh standard solutions.

Tester Specifications

	Model	S10
pH	Range	-2.000 to 20.000 pH
	Resolution	0.1, 0.01, 0.001 pH
	Accuracy	±0.002 pH
	Calibration Points	1 to 5 points
	pH Buffer Options	USA (pH 1.68, 4.01, 7.00, 10.01, 12.45)
		NIST(pH 1.68, 4.01, 6.86, 9.18, 12.45)
		DIN (pH 1.09, 3.06, 4.65, 6.79, 9.23, 12.75)
	Temperature Compensation	0 to 100°C (32 to 212°F), automatic
	Solution Temperature Coefficient	25°C (77°F)
mV	Range	±2000.0 mV
	Resolution	0.1, 1 mV
	Accuracy	±0.2 mV

	Model	S20
ORP	Range	±2000.0 mV
	Resolution	0.1, 1 mV
	Accuracy	±0.2 mV
	Calibration Point	1 point (for ORP mode only)

	Model	S30
Ion Concentration	Range	0.001 to 30000 (depending on range of the ion selective electrode)
	Resolution	0.001, 0.01, 0.1, 1
	Accuracy	±0.5% F.S. (monovalent), ±1% F.S. (divalent)
	Measurement Units	ppm, mg/L, mol/L, mmol/L
	Calibration Points	2 to 5 points
	Calibration Solutions	0.001, 0.01, 0.1, 1, 10, 100, 1000
	Temperature Compensation	0 to 100°C (32 to 212°F), manual
	Measurement Methods	Direct reading
		Known addition
		Known subtraction
		Sample addition
		Sample subtraction
	Electrode Management	1 to 3 electrodes
mV	Range	±2000.0 mV
	Resolution	0.1, 1 mV
	Accuracy	±0.2 mV

	Model	S40
Water Hardness	Range	Concentration: 0.05 to 200 mmol/L
		German degree: 0 to 1122°dH
		English degree: 0 to 1404°e
		French degree: 0 to 2000°fH
		Grains per gallon: 0 to 1170 gpg
		$CaCO_3$: 0 to 20000 mg/L
		CaO: 0 to 11220 mg/L
		Ca^{2+}: 0 to 8020 mg/L
	Resolution	0.001, 0.01, 0.1, 1
	Accuracy	±1% F.S.
	Calibration Points	2 to 5 points
	Calibration Solutions	0.01, 0.1, 1, 10, 100 mmol/L
	Temperature Compensation	0 to 50°C (32 to 122°F), manual
mV	Range	±2000.0 mV
	Resolution	0.1, 1 mV
	Accuracy	±0.2 mV

	Model	S50-M	S50-H
Conductivity	Range	0 to 2000 µS/cm, 20.00 mS/cm	100.0 to 2000 µS/cm, 200.0 mS/cm
	Resolution	0.01, 0.1, 1	
	Accuracy	±0.5% F.S.	
TDS	Range	0 to 1000 mg/L, 20.00 g/L	0 to 1000 mg/L, 200.0 g/L
	Resolution	0.01, 0.1, 1	
	Accuracy	±1% F.S.	
	TDS Factor	0.01 to 1.00 (default 0.5)	
Salinity	Range	0.00 to 10.00 PSU	0.00 to 42.00 PSU
		0.00 to 10.00 ppt	0.00 to 80.00 ppt
		0.00 to 1.00%	0.00 to 8.00%
	Resolution	0.01	
	Accuracy	±1% F.S.	
Resistivity	Range	0.00 to 10.00 MΩ	0.00 to 1.00 MΩ
	Resolution	0.01, 0.1, 1	
	Accuracy	±1% F.S.	
Conductivity Ash	Range	0 to 100%	
	Resolution	0.01, 0.1, 1	
	Accuracy	±1% F.S.	
	Measurement Modes	Refined sugar, Raw sugar	
Other	Calibration Points	1 to 3 points	
	Calibration Solutions	84 µS/cm, 1413 µS/cm, 12.88 mS/cm	1413 µS/cm, 12.88 mS/cm, 111.8 mS/cm
	Temperature Compensation	0 to 100°C (32 to 212°F), automatic	
	Temperature Coefficient	Linear (0.0 to 10.0%/°C), non-linear, USP, EP	
	Pure Water Compensation	Yes	
	Reference Temperature	20°C or 25°C	

	Model	S60
Dissolved Oxygen	Range	0.00 to 20.00 mg/L
	Resolution	0.01, 0.1 mg/L
	Accuracy	±0.2 mg/L
Saturation of Oxygen	Range	0.0 to 200.0%
	Resolution	0.1%
	Accuracy	±2.0%
Other	Calibration Points	1 or 2 points
	Temperature Compensation	0 to 50°C (32 to 122°F), automatic
	Barometric Pressure Correction	60.0 to 113.3 kPa, 450 to 850 mmHg, manual
	Salinity Correction	0.0 to 50.0 g/L, manual

General Specifications	
Operating Temperature	0 to 50°C (32 to 122°F)
Storage Temperature	0 to 60°C (32 to 140°F)
Relative Humidity	< 80% (non-condensing)
IP Rating	IP54
Connectivity	Bluetooth 4.0 or newer
Max Wireless Range	10 m (32.8 ft.)
Power Requirements	2 × 1.2V lithium batteries or AAA batteries
Dimensions	Model S10/S20/S50: 185 (L) × 40 (Ø) mm (7.28 × 1.57 in.) Model S30/40: 175 (L) × 40 (Ø) mm (6.89 × 1.57 in.)
Weight	100 g (3.5 oz.)

Disposal

This product is required to comply with the European Union's Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC and may not be disposed of in domestic waste. Please dispose of product in accordance with local regulations at the collecting point specified for electrical and electronic equipment.

Warranty

The warranty period for tester is one year from the date of shipment. Above warranty does not cover the electrode and standard solutions. Out of warranty products will be repaired on a charged basis. The warranty on your tester shall not apply to defects resulting from:

- Improper or inadequate maintenance by customer
- Unauthorized modification or misuse
- Operation outside of the environment specifications of the products

For more information, please contact the supplier.

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