SX736 Portable pH/Conductivity/DO Meter

User Manual

CE ISO 9001:2015 IP57 WATERPROOF

APERA INSTRUMENTS, LLC

aperainst.com

Table of Contents

Scan the QR code below to watch the tutorial video on Youtube.

1 Brief Instruction

Thank you for choosing Apera Instruments SX736 Portable pH/DO/conductivity Meter (will be called “the meter” in short in the following content). Before using the meter, please read this instruction manual carefully in order to help you properly use and maintain it.

The meter can measure the parameters of pH, conductivity, TDS, salinity, resistivity, DO and temperature of water solutions with high accuracy. It is suitable for various applications in different industries e.g., water treatment, aquaculture, horticulture, pools, beverage making, mining, power plants, environmental monitoring, etc., especially ideal for in-field use.

The meter has the following features:

1.1. Built-in microprocessor chip with the intelligent functions of auto. calibration, auto. temperature compensation, auto. salinity compensation, manual baromatric pressure compensation, data storage, function settings, auto. power off, and low voltage display etc.

1.2. Adopts digital filter technology to intelligently improve meter’s response speed and accuracy. The smiley face icon will appear when the reading is stable.

1.3. Pure water modes available for pH and conductivity, significantly increasing the accuracy.

1.4 Unique 1-point conductivity calibration covering a wide range of 0 to 200mS, easy to use.

1.5. The polarographic DO electrode has a special electrode calibration sleeve. The electrode polarization only takes 5 minutes. Electrode adopts a combo-style membrane cap, which is very convenient to use. Each DO electrode comes with three backup membrane caps.

1.6. Meter’s LCD screen has clear and bright backlit display.

1.7. Built-tough. IP57 waterproof and dust-proof.

2 Technical Specifications

2.1 pH

Measurement range	(-2.00 to 19.99) pH
Resolution	0.1/0.01 pH
Accuracy	Meter: ±0.01pH; Overall: ±0.02pH
Input current	≤2×10^{-12} A
Input impendance	≥1×1012 Ω
Stability	±0.01 pH/3h
Temp. compensation range	(0 to 100) ˚C (automatic)

2.2 mV

Measurement range (mV/ORP/EH)	-1999 mV to 0 to 1999mV
Resolution	1mV
Accuracy	Meter: ±0.1% FS, Overall: ±15mV

2.3 Conductivity

Measurement range	Conductivity: (0.00 to 19.99)μS/cm (20.0 to 199.9)μS/cm (200 to 1999)μS/cm (2.00 to 19.99) mS/cm (20.0 to 199.9) mS/cm TDS: (0 to 100) g/L; Salinity : (0 to 100) ppt Resistivity: (0 to 100) MΩ·cm
Resolution	0.01/0.1/1μS/cm 0.01/0.1 mS/cm
Accuracy	Meter: ±1.0% F.S, Overall:±1.5% F.S
Temp. compensation range	(0 to 50) ˚C (automatic)
Electrode constant	0.1 / 1 / 10 cm-1
Reference temperature	25˚C, 20˚C, and 18˚C

2.4 Dissolved Oxygen

Measurement range	(0 to 19.99) mg/L (ppm); (0 to 200.0) %
Resolution	0.1/0.01 mg/L (ppm) 1/0.1%
Accuracy	±0.30 mg/L (ppm), including electrode error

Response time	≤30s (25˚C, 90% response)
Temp. compensation range	(0 to 45) ˚C (automatic)
Salinity compensation range	(0 to 45) ppt (automatic)
Barometric pressure compensation range	(66 to 200) kPa (manual)
Automatic calibration	Air saturated by water; water saturated by air
Electrode type	Polarographic

2.5 Other Technical Parameters

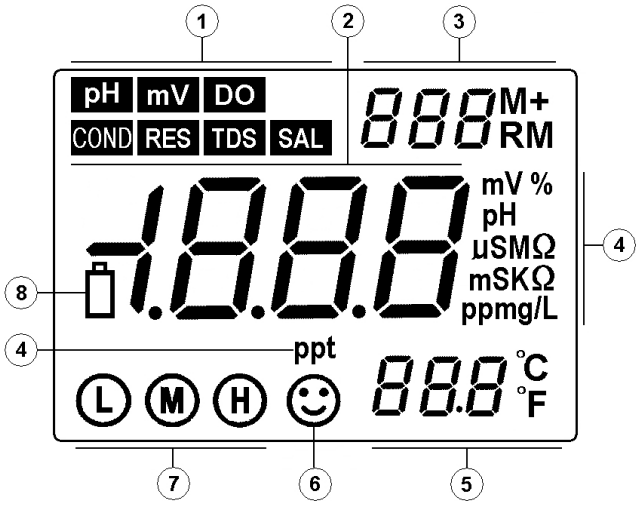
Data storage	400 sets
Data content	Serial number, measurement value, measurement unit, and temperature
Power Supply	Two AA alkaline batteries (1.5V x2)
Dimensions and weight	Meter: (65×120×31) mm/180g Complete Kit: (255 x 210x 50) mm/1760g
Quality and safety certification	CE, ISO 9001:2015

2.6 Working Condition

Working temperature	5 to 35˚C
Working humidity	≤85%
IP rating	IP57 water-resistant

3 About the Meter

3.1 Screen Display



① —— Parameter icon ② —— Measurement value

③ —— Serial number and icon as measurement to be saved and recalled and indication icon for special states.

M+ — measurement value to be saved; **RM** — Saved data to be recalled;

④ —— Measurement unit ⑤ —— Temperature measurement value and unit

⑥ —— Measurement stabilization icon ⑦ —— Electrode calibration indication icon

⑧ —— Indication icon of low battery power; appears when the voltage is less than 2.6V, calling attention to replace the batteries.

3.2 Keypad

The meter has 5 operation keys in total.

Short press: press time <1 seconds; Long press: press time >2 seconds

3.2.1. ON/OFF — Short press to power on or off.

3.2.2. CAL — Calibration key

(a) When in measurement mode, short press to enter calibration mode.

(b) When in parameter setting mode, short press to make changes.

3.2.3. MODE — Function key

(a) In **pH** measurement mode, short press (<1.5s) to switch between **pH** and **mV** . Long press to enter parameter setting (P1, P2, P3…)

(b) In other measurement mode, short press this key to enter the parameter setting mode (P1, P2, P3…)

3.2.4. ☼/ENTER Backlight and confirmation key

(a) In measurement mode, short press to turn on or off the backlight.

(b) In calibration mode or the parameter setting, press this key to make confirmation, and return to measurement mode.

(c) When in **pH** mode, hold this key to change pH resolution: 0.01→0.1 pH in turn. Release key when you confirm the selection.

(d) When in COND measurement mode, hold this key to change parameter in turn:

TDS (Total Dissolved Solids) → **SAL** (salinity) → **RES** (resistivity)→ **COND** (conductivity). Release the key when you confirm the selection.

(e) When in **DO** mode, hold this key to change DO in turn: **mg/L→ppm→%.**

Release the key when you confirm the selection.

3.2.5. M+/RM — The key for data saving and recalliing

(a) When in measurement mode, short press to save the measurement data; Long press to recall the saved data.

(b) When in parameter setting mode, press the key to make changes.

3.3 Data Log, Recall and Delete

3.3.1. Save the measurement:

In measurement mode, when the reading is stable and ☺ stays on screen, short press M+/RM to save the measurement data. **M+** icon and the data serial number will show up on the upper right corner. The meter can store up to 400 sets of data.

3.3.2. Recall saved data:

(a) In measurement mode, long press M+/RM , the meter will recall the last saved data and the serial number. **RM** icon will appear in the upper right corner of the screen.

Short press CAL again, the meter will recall all the data in turn, hold CAL or M+/RM to quickly review the data.

(b) In data recalling mode (**RM** and serial number in the upper right corner), short press ☼/ENTER to return to measurement mode.

3.3.3. Delete data:

In data recalling mode, hold ☼/ENTER for 5 seconds, **CLr** will show up for 2 seconds, meaning that all the saved data have been eliminated. Then the meter will return to measurement mode.

4 What's in the kit

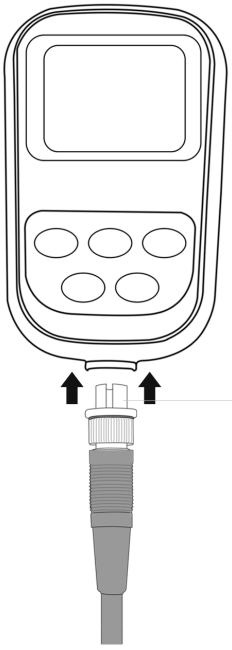
SX736 pH/ORP/Conductivity/DO meter *1	201T-S plastic pH/ATC three-in-one combination electrode *1	DO503 membrane cap (DO electrode use) *3
2301T-S plastic conductivity electrode *1	DO500 DO electrode *1	DO502 DO electrode inner solution (30mL) *1
1413μS/cm conductivity standard solution (50mL) *1 bottle	pH standard buffer solution (pH4.00, pH7.00, pH10.01) *1 50ml bottle/each	
Cathode polishing paper *2	Screw driver *1	Spare AA batteries *2
Operation manual *1	Carrying case *1	

5 Preparation

What you need in addition to what's in the kit:

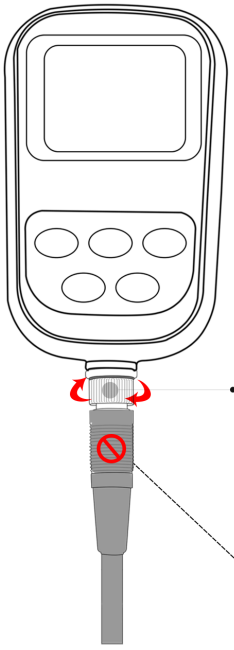
Pure water (RO, distilled or deionized water) for rinsing off the electrode.

Connect the Electrode



• Step 1

Align the notches, hold the metal ring and push in directly

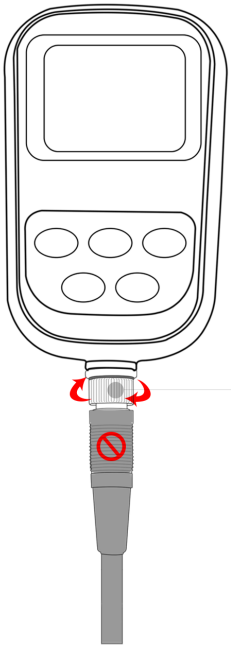


• Step 2

Tighten the metal ring to lock the connection

ATTENTION:
NEVER twist the black rubber part (could lead to damage)

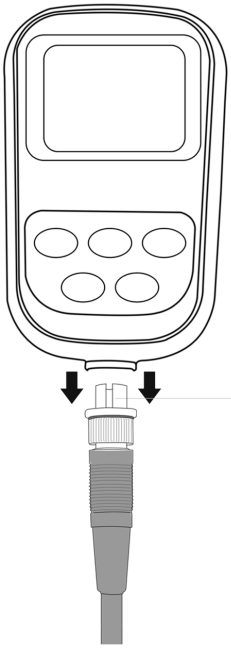
Disconnect the Electrode



ATTENTION:
NEVER twist the black rubber part (could lead to damage)

• Step 1

Loosen the metal ring to unlock the connection



• Step 2

Hold the metal ring and pull off directly

6 pH Measurement

Short press ON/OFF to turn on the meter. Connect 201T-S pH electrode to the meter (See Section 5 for connection tutorial). The meter will automatically enter pH measurement mode.

6.1 pH Electrode

The meter comes with the 201T-S 3-in-1 combination electrode with a built-in temperature sensor, which enables automatic temperature compensation. **This electrode is only suitable for general water solutions' pH testing.** Please refer to Section 6.5 for ideal pH electrodes to use for other applications. A 3M KCL storage bottle comes with the electrode, which is for storing the electrode when not in use to keep the sensitivity of the probe.

6.1.1 Technical Specifications of the 201T-F pH Electrode

Measurement Range: 0 - 14 pH, 0 - 80˚C (32 – 176˚F) ; Junction: Single Ceramic

Reference Electrode: Ag/AgCl Connector: 8-pin

Size: ø12*160 mm; cable length: 1 meter

Temperature unit: 30K Thermistor

6.1.2 Use the Electrode

Screw off the KCL storage bottle, and put it aside (do not dump or spill the KCL solution). Rinse the electrode with distilled or deionized water. Shake off excess water or blot-dry with clean tissue or kimwipe. Stir the electrode for a few seconds after it's dipped into the test solution and then hold it still. Wait for the reading to get fully stabilized (☺ appears and stays) and then take the measurement. When the test is finished, place the electrode in the storage bottle and tighten the cap to keep the sensitivity of the pH sensor.

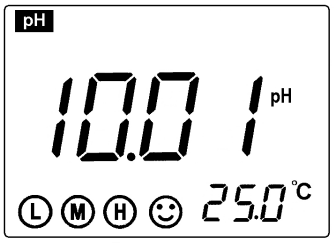
6.2 pH Calibration

6.2.1 After powering on the meter, short press CAL to enter calibration mode, C 1 flickers on LCD, indicating the meter enters the first point calibration.

6.2.2 Rinse off the pH electrode in pure water and remove excess water, then insert it into the pH7.00 buffer solution, make a quick stir and then hold it still. When the reading is stabilized and ☺ stays on screen, short press CAL again to finish the 1st point calibration. "**7.00 pH**" will start flickering and a flickering C2 will show up, indicating the 1st point calibration has been finished and the meter is entering the 2nd point calibration.

6.2.3. Rinse off the pH electrode in pure water and remove excess water, then insert it into the pH4.00 buffer solution, make a quick stir and then hold it still. When the reading is stabilized and ☺ stays on screen, short press CAL again to finish the 2nd point calibration. "**4.00 pH**" will start flickering and a flickering C3 will show up, indicating the 2nd point calibration has been finished and the meter is entering the 3rd point calibration.

6.2.4. Rinse off the pH electrode in pure water and remove excess water, then insert it into the pH10.01 buffer solution, make a quick stir and then hold it still. When the reading is stabilized and ☺ stays on screen, short press CAL again to finish the 3rd point calibration. "**10.01 pH**" will start flickering and then the meter will return to measurement mode.



Picture (4-1)

Ⓛ Ⓜ Ⓗ will show up at the bottom left (see picture 4-1), indicating all three points of calibration are finished.

6.3 Notes about pH Calibration

1) Keeping the freshness and cleanliness of calibration buffers is essential for accurate pH measurement. The small bottles of pH buffers come with the meter should be replaced within 3 months after opening. The new buffer solutions should be made by a legitimate lab supply manufacturer. Avoid sunlight and air contact when the buffers are not being used, and store at room temperature.
2) This meter can adopt random 1-point, 2-point or 3-point automatic calibration. During calibration, short press ☼ ENTER to return to measurement mode. When the measurement accuracy is ≤±0.1pH, choose a buffer that's close to the estimated measurement range and perform 1-point calibration would be good. Choose pH4.00 and pH7.00 to calibrate if the measurement range is within the acidity range (<pH 7) and choose pH7.00 and pH10.01 to calibrate if just within the alkalinity range (>pH 7).
3) Choose 3-point calibration to achieve a more accurate measurement if the measurement range is wide, or if the electrode has not been used for long. When connecting a new pH electrode, it must be calibrated at 3 points.
4) The frequency that you need to calibrate your meter depends on the tested samples, condition of electrodes, and the requirement of the accuracy. For High-Accuracy measurements (≤ ±0.02pH), the meter should be calibrated before test every time; For ordinary-accuracy measurements (≥±0.1pH), once calibrated, the meter can be used for about a week or longer. In the following cases, the meter

must be re-calibrated:

- The electrode hasn't been used for a long time or a new electrode is connected.
- After measuring strong acid (pH<2) or strong base (pH>12) solutions.
- After measuring fluoride-containing solution and strong organic solution.
- There is a significant temperature difference between the test sample and the buffer solution.

6.4 Sample Test

Power on the meter. Connect the pH electrode and the meter goes to pH measurement mode automatically. Screw off the KCL storage bottle. Rinse the electrode with pure water. Shake off excess water or blot-dry with clean tissue or kimwipe. Stir the electrode for a few seconds after it's dipped into the sample solution and then hold it still. Wait for the reading to get fully stabilized (☺ appears and stays). Then save the measurement by pressing M+/RM

According to the pH isothermal measurement principle, the closer the test sample's temperature is to the calibration solution's, the higher the accuracy of the measurement. This principle is recommended to follow for the best result. For example, if you must test at 150˚F, we recommend warming up the calibration solutions to the same temperature before performing calibration in order to get the most accurate readings.

6.5 Recommended pH Electrodes for Different Applications

Application	Ideal Apera pH Electrodes
General water solutions	201T-S, LabSen 211, LabSen 213
Beverage, beer, wine	LabSen 211, LabSen 213
Low ionic strength solutions (RO water, distilled water, deionized water…)	LabSen 801, LabSen 803
Liquid food (milk, cream, yogurt, jam, sauce, etc.)	LabSen 821, LabSen 823
High-Temperature solutions	LabSen 841, LabSen 861
Low-temperature liquid	LabSen881
High salinity solutions	LabSen 841
Complex and caustic solutions (e.g. electroplating)	LabSen 861

Raw meat	LabSen 761, LabSen 763
Micro sample testing	LabSen 241-6, LabSen 241-3
Cosmetics, skincare products	LabSen 851-1, LabSen 851-S
Soil	LabSen 551, LabSen 553
Solid or semi-solid samples (cheese, dough, fruits, meat products, etc.)	LabSen 251, LabSen 751, LabSen 753
Strong acid solutions, HF containing solutions (HF concentration<1%)	LabSen 831
Strong alkaline solutions	LabSen 841
Surface test (skin, paper, carpet, etc.)	LabSen 371
TRIS buffer solutions	LabSen 213, LabSen 223
Viscous solutions	LabSen851-S, LabSen 851-H
Wastewater or emulsion	LabSen 333

*** An 8-pin to BNC convertor (AI7103) is required to connect LabSen pH electrode to this meter.**

*** Visit aperainst.com/product/electrode/labsen or contact us at 1-614-285-3080 for more details.**

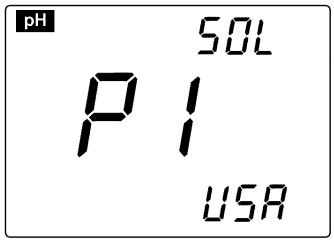
6.6 Parameter Setting

Table (4-1)

Prompt Mark	Parameter Setting Items	Code	Parameters
P1	pH buffer solution series selection	SOL	USA (U.S.A series) NIS (NIST series) CH (China series)
P2	Pure water pH temperature compensation setting	PU 1	OFF-On (shut-set)
P3	Ammonia added pure water pH temperature compensation setting	PU 2	OFF-On (shut-set)
P4	Temperature unit setting		˚C - ˚F
P5	Backlight display time setting	bL	0-1-3-6min
P6	Auto power off setting	AC	0-10-20min
P7	Restore to producer setting		OFF-On

6.6.1 pH buffer solution series selection (P1)

(a) Long press MODE, meter enters P1 mode: see picture (4-2).



Picture (4-2)

(b) Press CAL or M+ RM to choose buffer solution series:

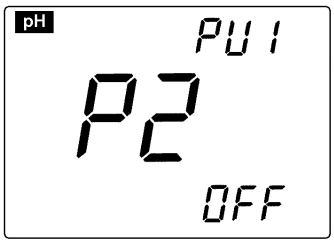
(U.S.A series) — 1.68, 4.00, 7.00, 10.01and 12.45 pH

(NIST series) — 1.68, 4.01, 6.86, 9.18 and 12.45 pH

(China series) — 1.68, 4.00, 6.86, 9.18 and 12.46 pH

(c) Press MODE to enter next parameter setting or press ENTER to confirm and return to measurement mode.

6.6.2 Pure water pH temperature compensation setting (P2)



Picture (4-3)

(a) Short press MODE in P1, the meter enters mode P2, see picture (4-3).

(b) Press CAL or M+ RM to choose On

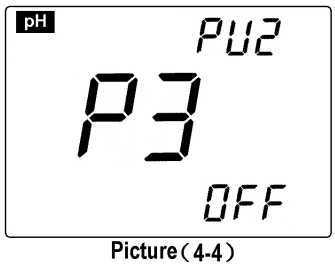
(pure water pH temperature compensation setting) or OFF

(c) Press MODE to enter next parameter setting or press ENTER to confirm and return to measurement mode.

(d) The factory default setting is OFF

Note: PU 1 will appear in the upper right corner of the LCD if pure water temperature compensation function is set.

6.6.3 Ammonia added pure water pH temperature compensation setting (P3)



Picture (4-4)

(a) Short press MODE in mode P2 to enter mode P3, see picture (4-4).

(b) Press CAL or M+ RM to choose On (ammonia added pure water pH temperature compensation setting) or OFF

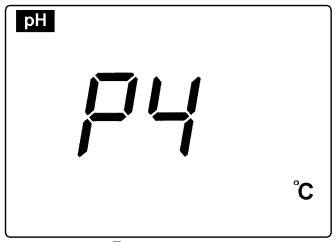
(c) Press MODE to enter next parameter setting or press ENTER to confirm and return to measurement mode.

(d) The factory default setting is OFF

Note: If the ammonia pure water pH temperature compensation function is set,

PU 2 will appear in the right upper corner of the LCD when in measurement mode.

6.6.4 ***Temperature unit ˚C/˚F setting (P4)***



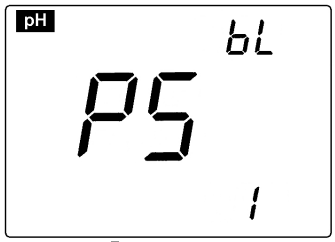
Picture（4-5）

(a) Short press MODE in P3 to enter P4, see picture (4-5).

(b) Press CAL or M+ RM to choose temperature unit: ˚C or ˚F.

(c) Press MODE to enter next parameter setting or press ☼ ENTER to confirm and return to measurement mode.

6.6.5 ***Backlight display time setting (P5)***



Picture（4-6）

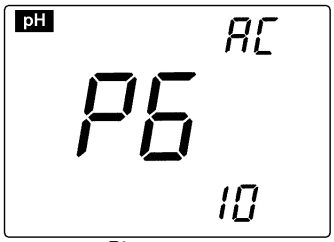
(a) Short press MODE in P4 to enter P5, see picture (4-6).

(b) Press CAL or M+ RM to choose the time of backlight auto off: 0 min, 1 min, 3 min or 6 min. The backlight will be closed if choosing 0 min.

(c) Press MODE to enter next parameter setting or press ☼ ENTER to confirm and return to measurement mode.

(d) The factory default setting for P5 is 1min.

6.6.6 ***Auto power off time setting (P6)***



Picture（4-7）

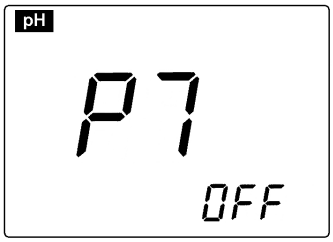
(a) Short press MODE in P5 to enter P6, see picture (4-7).

(b) Press CAL or M+ RM to choose the time: 0min, 10min or 20min. The auto power off function will be closed if choosing 0min.

(c) Press MODE to enter next parameter setting or press ☼ ENTER to confirm and return to measurement mode.

(d) The factory default setting for P6 is 10min.

6.6.7 ***Restore to factory default setting (P7)***



Picture（4-8）

(a) Short press MODE in P6 to enter P7, see picture (4-8).

(b) Press CAL or M+ RM to choose On , meaning that the parameters have been restored to the producer setting mode, and return to measurement mode after 2 seconds. Returning to factory default setting is to restore the meter to theoretical value (zero potential pH is 7.00, slope is 100%), and set all the parameters to default settings. When the meter's calibration or measurement is performing abnormally, users can use this function, and then calibrate and test again. Please note that this function is irreversible once used.

6.7 Cleaning pH Electrode

1) The measurement is only as accurate as the electrode is clean. Always thoroughly rinse off the electrode before and after each test with pure water.
2) For tough contaminants, soak the electrode in Apera electrode cleaning solution (AI1166) for at least minutes. Then use a soft brush to remove the contaminants. Afterwards, soak the electrode in 3M KCL soaking solution for at least 2 hours. Rinse it off, then re-calibrate the tester before using again.
3) For other special contaminants, refer to the table below:

Contamination	Cleaning Solution
Inorganic metal oxide	Dilute acid less than 1mol/L
Organic lipid, protein containing samples	Apera cleaning solution (AI1166)
Resin macromolecule	Dilute alcohol, acetone, ether
Paints	Dilute bleacher, peroxide

6.8 The Self-diagnose Information

During usage, the following icons may show up on LCD. This is the meter's self-diagnose information, which can help you understand what may go wrong with the meter or electrode.

6.8.1. The stable icon **-2.00 pH** or **19.99 pH** — this icon appears when the pH value exceeds the measurement range. This icon will also show up when the electrode is not well connected with the meter or when the electrode is not insertd into solution. This is a normal phenomenon.

6.8.2. Err 1 — Electrode offset out of range (<-60mV or >60mV)

6.8.3. Err2 — Electrode slope out of range (< 85% or >105%)

When Err 1 or Err2 shows up:

1) Make sure there is no damage on the electrode's glass bulb (if so, an electrode replacement is necessary). Check if there is air bubble inside the glass bulb. If so, shake the electrode with force for several seconds to remove the bubble.
2) Check the quality of buffer solution. Make sure it's fresh and clean and conforms to the meter's buffer series setting.
3) Set the meter to factory default setting mode (refer to section 6.6.7), then recalibrate it.

If the meter is still not working after the above checkings, it's time to replace a new pH electrode or contact us at +1 (614) 285-3080 or info@aperainst.com for help.

6.9 Notes about pH

1) Never store pH electrode in pure water as it will damage the electrode. Always store the electrode in 3M KCL soaking solution (AI1107).
2) If you find any air bubble in the glass bulb of the pH sensor, simply shake the probe with force for a few times to remove it. The existence of an air bubble in the glass bulb will significantly decrease the stableness of measurement.
3) pH electrode is technically a chemical battery. Every pH electrode will eventually die even if you don't use it at all. The typical service life of a pH electrode is 1-2 years depending on how you use and maintain it. We recommend replacing your pH electrode after one year of use to ensure the best result.
4) Always keep the meter's connector clean and dry, otherwise it may lead to an inaccurate measurement. If contaminated, clean the connector with alcohol prep pads and blow-dry.

7 Conductivity Measurement

7.1 Preparation

Press ON/OFF to power on, connect the 2301T-S conductivity electrode (See Section 5 for connection tutorial); the meter will automatically change to conductivity measurement mode.

7.2 Conductivity Calibration:

8.2.1 Short press CAL to enter calibration mode, CAL flickers on LCD, indicating the meter enters calibration mode. Rinse off the electrode in pure water and remove excess water, then insert it into the 1413μS standard solution, make a quick stir and then hold it still. When the reading is stabilized and stays on screen, short press CAL again to finish calibration. **1413 μS** will start flickering and then a flickering End will show up, and the meter will return to measurement mode. M shows up at the lower left corner, indicating a successful conductivity calibration. If the measurement is not stable, you can perform the calibration once again.

Note: Conductivity can only be calibrated under the mode of conductivity. If in other modes, please switch back to conductivity before pressing CAL .

7.3 Sample Test

Screw off the storage bottle. Rinse the electrode with pure water. Shake off excess water or blot-dry with clean tissue or kimwipe. Stir the electrode for a few seconds after it's dipped into the sample solution and then hold it still. Wait for the reading to get fully stabilized (☺ appears and stays). Then save the measurement by pressing M+/RM.

Hold ☼/ENTER to switch measurement unit:

TDS (TDS) → SAL (Salinity) → RES (Resistivity)→ COND (Conductivity).

Release the button when you make a selection.

7.4 Conductivity Electrode's Maintenance

1) Always keep the conductivity electrode clean. Before taking a measurement, rinse the electrode in pure water. It is recommended to rinse it again in the sample solution. When submerge the electrode in solution, stir the solution briefly to eliminate air bubbles and allow it to stay until a stable reading is reached. Conductivity electrodes are usually stored dry. When not in use, store the conductivity electrode in pure water.
2) The sensor of 2301T-S conductivity electrode is coated with platinum black to minimize electrode polarization and expand measuring range. The platinum black coating adopted our special processing technology, which improves the electrode performance and the firmness of the coating. If the platinum black electrode is stained, gently clean the electrode with soft brush in warm water containing detergent or alcohol.

7.5 Notes about Conductivity Calibration

1) This meter has a unique one-point calibration function, to choose the standard calibration solution that's close to your sample's conductivity. In general, the most common calibration solution is 1413 μS/cm. Use the equipped 2301T-S conductivity electrode (K = 1.0). Please choose the calibration solution according to the Table (6-1).
2) The conductivity electrode has been calibrated before meter leaving factory. In general, user can directly use it.
3) We recommend calibrating the electrode once every month. It is necessary to perform calibration when replacing a new conductivity electrode.

Table (6-1)

Measurement range	0.05 to 20μS/cm	0.5μS/cm to 200mS/cm		
Electrode constant	K=0.1 (flow test)	K=1.0		
Calibration solution	84μS/cm	84μS/cm	1413μS/cm	12.88 mS/cm 111.9 mS/cm
Calibration icon	Ⓛ	Ⓛ	Ⓜ	Ⓗ

Note: When you choose to use DJS-0.1-S pure water conductivity electrode (sold separately, K=0.1, no temperature sensor built in), you can use Manual Temperature Compensation mode: long press MODE *, temperature value starts flickering, press* CAL *or* M+ RM *to change the value of temperature and then press* ENTER *to confirm.)*

7.6 Parameter Setting:

Conductivity measurement parameter setting Table

Table (6-3)

Prompt Mark	Parameter Setting Items	Code	Parameter
P1	Standard solution series selection	SOL	USA (84μS/cm, 1413μS/cm, 12.88 mS/cm, 111.9 mS/cm) CH (146.6μS/cm, 1408μS/cm, 12.85mS/cm, 111.3mS/cm)
P2	Electrode constant selection	Con	0.1, 1, 10
P3	Reference temperature selection	rEF	25˚C 20˚C 18˚C
P4	Temperature compensation coefficient setting	tCC	0.00 to 9.99%
P5	Electrode constant setting	CC	
P6	Temperature unit setting		˚C / ˚F
P7	Backlight display time setting	bL	0-1-3-6min
P8	Auto power off time setting	AC	0-10-20min
P9	Restore to producer setting		OFF-On

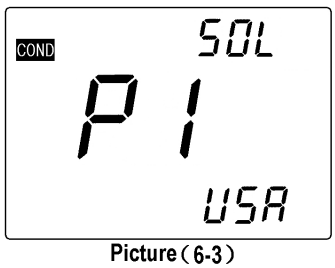
7.6.1 Conductivity calibration solution series selection (P1)

(a) Press MODE, meter enters P1 mode, see picture (6-3);

(b) Press CAL or M+ RM to choose the standard solution series:

USA —U.S.A. series CH — China series

(c) Press MODE to enter the next parameter setting or press ENTER to return to measurement mode.



Picture (6-3)

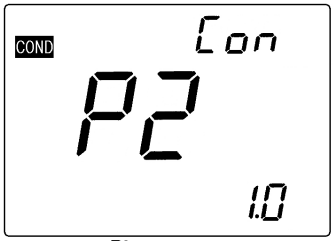
7.6.2 Electrode constant selection (P2)

(a) In P1, short press MODE to enter P2 mode, see picture (6-4);

(b) Press CAL or M+/RM to change the constant setting: 0.1→1.0→10.0.

(c) Press MODE to enter the next parameter setting or press ☼/ENTER to return to measurement mode.

(d) The factory default setting of P2 is K=1.0.



Picture (6-4)

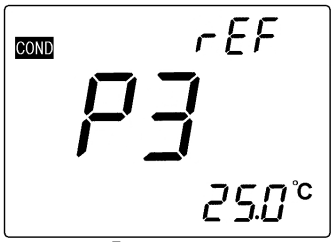
7.6.3 Reference temperature selection (P3)

(a) In P2, short press MODE to enter P3, see picture (6-5);

(b) Press CAL or M+/RM to choose 25˚C→20˚C→18˚C;

(c) Press MODE to enter the next parameter setting or press ☼/ENTER to return to measurement mode.

(d) The factory default setting of P3 is 25˚C.



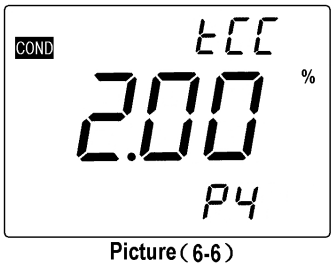
Picture (6-5)

7.6.4 Temperature compensation coefficient setting (P4)

(a) In P3, short press MODE to enter P4, as shown in picture (6-6);

(b) Press CAL or M+/RM to change the number, the changing range of data is from 0.00 to 9.99; long press CAL or M+/RM to change quickly.

Attention: When the number set as 0.00, means there is no temperature compensation, for details please see Section 7.7;



Picture (6-6)

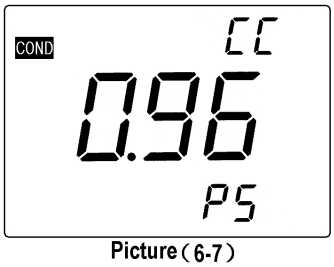
(c) Press MODE to enter the next parameter setting or press ☼/ENTER to return to measurement mode.

(d) The producer setting of P4 is 2.00%.

7.6.5 Constant calibration setting (P5), please refer to Section 8.5.

(a) In P4, short press MODE to enter P5, LCD display last calibration constant. For example, 0.96cm-1 shown as picture (6-7);

(b) Press CAL or M+/RM to change number when the number is flickering, and finish setting the constant which marked on the housing of conductivity electrode.



Picture (6-7)

(c) Press MODE to enter the next parameter setting or press ☼/ENTER to return to measurement mode.

(d) If you need to do calibration for other conductivity electrode whose constant is not 1.0, e.g. conductivity electrode with constant 10.3, you should enter constant setting P2 to set the constant to be “10”, then enter P5 mode and set the constant to be 10.3.

7.6.6 Temperature units ℃/℉ selection (P6)

In P5, short press MODE and enter P6, for details please refer to Section 6.6.4.

7.6.7 Backlight display time setting (P7)

In P6, short press MODE and enter P7, for details please refer to Section 6.6.5

7.6.8 Auto power off time setting (P8)

In P7, short press MODE and enter P8, for details please refer to Section 6.6.6

7.6.9 Restore to producer setting (P9)

In P8, short press MODE and enter P9, for details please refer to Section 6.6.7

7.7 Temperature compensation coefficient

The temperature compensation coefficient of the meter setting is 2.0%/°C. However, the conductivity temperature coefficient is different from solutions and concentration. Please refer to Table – 11 and the data collected during testing. Do the setting in P4. (see Section 7.6.4 for more).

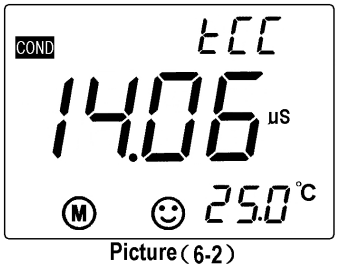
Note: When the coefficient for the temperature compensation is set to 0.00 (no compensation), the measurement value will be based on the current temperature.

Table-11 Temperature compensation coefficient of special solutions

Solution	Temperature compensation coefficient
NaCl solution	2.12%/°C
5% NaOH solution	1.72%/°C
Dilute ammonia solution	1.88%/°C
10% hydrochloric acid solution	1.32%/°C
5% sulfuric acid solution	0.96%/°C

7.8 Notes about conductivity parameter setting

When the content of conductivity parameter setting is different to the factory default setting, the correspondant code icon will appear on the upper right of LCD in measurement mode. When more than one conductivity parameter is changed, only one code will be displayed. You need to enter the parameter setting and check the settings content or restore the meter to factory default setting and set the needed parameters again.



Picture（6-2）

8 DO Measurement

8.1 Preparation before use

1) Connect the DO electrode (See Section 5 for connection tutorial). Then Press ON/OFF to power on.

2) Choose DO unit: Hold ENTER to switch among mg/L, ppm and %. When the desired unit shows up, release the button to confirm the unit selection.

8.1.1 Check the sponge

Check on the DO500 DO electrode: see picture (4-1). Screw off the bottom lid of electrode calibration sleeve, inspect whether the sponge inside is moist. If it is dried out, add in several drops of distilled water to the sponge to maintain the satured air inside the calibration sleeve (Do NOT add too much water so it won't be dripping).

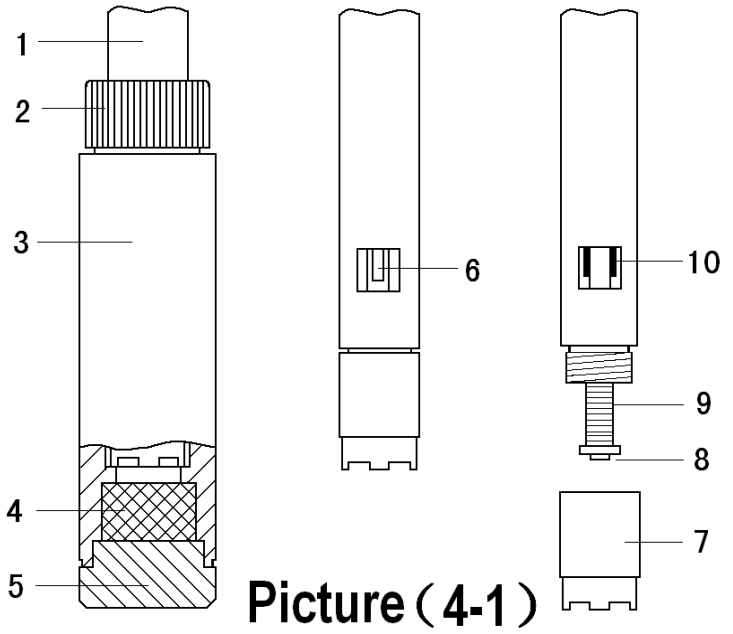
8.1.2 Electrode polarization

After each power on, the DO electrode must be polarized for 5 minutes before measurement or calibration. So do not to turn off the meter in the middle of your DO measurement. Otherwise, you need to polarize the DO electrode again after next power on (The auto. power off function in DO mode has been turned off by default).

8.1.3 How to polarize the DO electrode

Just connect the DO electrode to the powered-on meter without measurement or calibrating.

Electrode polarization is to consume the remaining oxygen inside the inner solution of the membrane cap so as to ensure fast response and high accuracy. If a new membrane cap is replaced, or new inner solution is added, the polarization time should be 30 minutes instead of 5 minutes.



Picture (4-1)

1 — DO500 DO electrode

2 — Calibration sleeve cap

3 — Calibration sleeve

4 — Water stored sponge

5 — Calibration sleeve bottom lid

6 — Temperature electrode

7 — Membrane cap

8 — Cathode (gold)

9 — Anode (silver)

10 — Salinity electrode

8.2 DO Calibration (Saturated Oxygen)

Power on the meter, press CAL, the meter enters calibration mode, **CAL** will be flashing at the upper-right corner. Insert the DO electrode to the calibration sleeve, and tighten the sleeve cap. Let the electrode sit for 3 to 5 minutes.

When the reading is fully stabilized, press CAL again to finish the calibration. A flashing **100%** will show up, and the calibration will be finished in several seconds and the meter will return to measurement mode. If the reading is unstable, please wait for several more minutes. Do NOT press CAL until the reading is fully stabilized.

8.3 DO Measurement

8.3.1 Measurement DO in flowing water

Power on the meter. Place the DO electrode into the flowing water. The water surface level should be higher than the location of the temperature electrode. The angle for the electrode and water surface should be 45° to 75°.

Hold the electrode in the flowing water and wait for a stable reading, then press M+/RM to record the measurement. If the reading cannot be stabilized, keep swirling the electrode slowly in water to help you get a stable reading (typically takes 1-5 minutes).

8.3.2 Measurement DO in static water

Power on the meter. Place the DO electrode into water. The water surface level should be higher than the location of the temperature electrode. The angle for the electrode and water should be 45° to 75°. Keep swirling the electrode in water slowly (>5cm/s) for 1 to 5 minutes. When the reading is fully stabilized, record the measurement (do NOT stop the swirling while recording the measurement).

Never stop the DO electrode swirling in static water while measurement. Otherwise, the dissvolved oxygen will be consumed by the DO electrode and the reading will keep dropping.

8.4 Notes about DO Measurement

a) When calibrating, the environment temperature and water temperature should be close to each other (≤10˚C). If the difference is large, please dip the electrode into the sample water for about 10 minutes, then calibrate the electrode according to Section 8.2.

b) Temperature has a large impact on DO measurement. When the electrode temperature and water temperature have larger difference, the reading time must be greater than 3 minutes. Otherwise, there could be some large errors.

c) Salinity and barometric pressure also affect DO measurement. The meter has automatic salinity compensation and manual barometric pressure compensation. For details, refer to Section 8.9.3.

d) When the meter is performing abnormally, please set the mode P7 to be **"**On**"** to restore meter to factory default setting, and then do the calibration again before measurement.

8.5 DO Electrode Maintenance

8.5.1 Always maintain a moist sponge

Screw off the bottom lid of electrode calibration sleeve (see picture 4-1), inspect whether the sponge inside is moist. If it is dried out, please add in several drops of distilled water to the sponge to maintain the satured air inside the calibration sleeve (Do NOT add too much water so it won't be dripping).

8.5.2 Remove air bubbles

Inspect the inner solution within the electrode membrane cap. Make sure it doesn't have air bubbles. If there are air bubbles, please screw off the membrane cap and add in new inner solution to remove the bubbles. Then screw the cap back on.

8.5.3 Clean the gold cathode

When the gold cathode is contaminated, use the polishing paper (DO504) to lightly wipe the gold cathode (along the arc of the gold surface); clean the gold surface with a clean tissue or kimwipe afterwards; rinse off the electrode with distilled water, then shake off excess water; Add some new inner solution into the membrane cap; screw on the cap. Then perform the saturated oxygen calibation according to 8.2 before measurement again.

8.5.4 Replace the membrane cap

When the DO electrode's response time becomes slower, obvious errors occur in measurement, or when the sensitive membrane of DO electrode is wrinkled, cracked, or damaged at any extent (the well-functioning membrane surface should look perfectly smooth), it's time to replace a new membrane cap (DO503) according to the following steps.

a) Screw off the membrane cap;

b) Rinse off the electrode without membrane cap with distilled water and shake off excess water.

c) Clean on the cathode surface (gold slice) with a clean tissue or kimwipe;

d) Add new inner solution (DO502) into a new membrane cap (DO503) slowly and do not let any air bubbles appear. If you found any air bubbles in the cap, carefully flick on the membrane cap to eliminate them.

e) Place the membrane cap on the table and put in the electrode vertically, slowly twist in, and then screw on the cap tightly. The excess inner solution will be squeezed out. Please wipe it off with tissue and rinse off the electrode in distilled water.

f) Check if there are any air bubbles in electrolyte (except for the smaller air bubbles), If so, re-assembly is needed.

g) Do not touch the sensitive membrane with fingers directly because the sweat and grease will affect the quality of the membrane.

8.6 Zero Oxygen Calibration

Usually there is no need to do zero oxygen calibration unless you have a high requirement for accuracy in low oxygen level (<1.0 ppm). To do zero oxygen calibration, follow the steps below:

Prepare 100mL of zero-oxygen water: In a 100 mL beaker, add in 5.0 g anhydrous sodium sulfite (Na_2SO_3); add distilled water to 100 mL, mix well to dissolve. Note that the zero-oxygen water is only effective within 24 hours.

1) Polarize the meter for 15 minutes, and then perform the saturated oxygen calibration according to the 8.2.

2) Place the electrode into zero-oxygen water, press CAL to enter calibration mode. When the stabilized reading is 0.02 ppm to 0.15 ppm after 5 minutes, press CAL again to finish the calibration, then flashing **0.0%** will show up, the calibration will be finished in several seconds and **0.00 ppm** will show up. Rinse off the electrode with distilled water afterwards.

3) If the reading is less than 0.02 ppm after 5 minutes, it means the electrode is in good condition and there is no need to perform zero oxygen calibration. Just press ☼ ENTER return to measurement mode.

4) If the reading is greater than 0.15 ppm after 5 minutes, it's time to replace the membrane cap according to section 9.5.4 or remove the membrane cap and use the polishing paper (DO504) to lightly polish the gold cathode according to section 8.5.3. Then perform the saturated air calibration and zero oxygen calibration before measurement.

8.7 Salinity Calibration

Dissolved oxygen is also affected by salinity in water. The meter has automatic salinity compensation, and the salinity electrode is pre-calibrated before leaving the factory. In general, there is no need to perform salinity calibration. Salinity calibration is only needed when replacing a new electrode. For the procedure of salinity calibration, please refer to 8.9.3 in P2.

For the salinity electrode installed in DO electrode (see picture 4-1), its surface is plated with a layer of platinum black to reduce electrode polarization. When cleaning salinity electrode, never brush it otherwise the coating will be peeled off. Just rinse it off by swirling in pure water to remove contaminants. For organic contaminants, rinse off with warm water containing detergent or alcohol.

8.8 Barometric pressure manual compensation

Dissolved oxygen is also affected by barometric pressure. The meter has the function of manual barometric pressure compensation. We suggest resetting the value according to the standard barometric pressure table when there is a big change in barometric pressure to ensure the accuracy of barometric pressure compensation (Please see Appendix 2 and Appendix 3). For the procedure of barometric pressure calibration, refer to 8.9.4.

8.9 Parameter Setting

8.9.1 DO parameter settings (Chart 4-1)

Prompt Mark	Parameter Setting Items	Code	Parameter
P1	Resolution selection		0.01/0.1(mg/L and ppm) 0.1/1(%)
P2	Salinity calibration		
P3	Barometric pressure setting		
P4	Temperature unit setting		˚F/˚C
P5	Backlight display time setting	bL	0-1-3-6 min
P6	Auto power off time setting	AC	0-10-20 min
P7	Restore to producer setting		OFF-On (shut-set)

8.9.2 ***Resolution selection (P1)***

(a) Press MODE to enter P1 mode, see picture (4-2);

(b) Press CAL to choose resolution: 0.01→0.1;

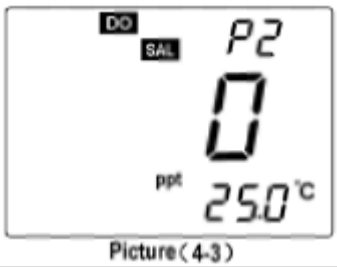
(c) Press MODE to enter the next parameter setting or press ENTER to return to the measurement mode.

Picture(4-2)

8.9.3 ***Salinity calibration setting (P2)***

(a) In P1, short press MODE to enter P2, see picture (4-3).

(b) Immerse the DO electrode into 12.88mS/cm calibration solution (sold separately), solution level should exceed salinity electrode; let it stand still after stirring; then press CAL when the value is stable and smiley face icon appears. **12.9** will show up on the screen. The calibration will be finished after several seconds, and the meter will display a stable salinity value.



Picture(4-3)

(c) Short press MODE to enter the next parameter setting or short press ENTER to return to measurement mode.

8.9.4 ***Barometric pressure setting (P3)***

(a) In P2, short press MODE to enter P3, the screen displays a barometric pressure measurement value set earlier (unit is kPa), such as 101.3 kPa, shown as picture (4-4).

(b) Press CAL or M+ RM to adjust according to standard barometric pressure value, and long press them to quickly change the value.

(c) Press MODE to enter next parameter setting or short press ENTER to confirm and return to measurement mode.

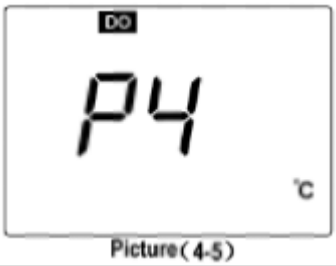
Picture(4-4)

8.9.5 ***Temperature unit ˚C/˚F setting (P4)***

(a) Short press MODE in P3 to enter P4, see picture (4-5).

(b) Short press CAL or M+ RM to choose temperature unit: ˚C or ˚F.

(c)Short press MODE to enter next parameter setting or short press ENTER to return to measurement mode.



Picture(4-5)

8.9.6 Backlight display time setting (P5)

Picture (4-6)

(a) Short press MODE in P4 to enter P5, see picture (4-6).

(b) Short press M+/RM or CAL to choose the auto-off time of backlight: 0 min, 1 min, 3 min or 6 min. The backlight display function will be closed if choosing 0 min.

(c) Short press MODE to enter next parameter setting or short press ☼/ENTER to return to measurement mode.

(d) The default setting for P5 is 1 min.

8.9.7 Auto power-off time setting (P6)

Picture (4-7)

(a) Short press MODE in P5 to enter P6, see picture (4-7).

(b) Press CAL or M+/RM to choose the time: 0min, 10min or 20min. The auto power off function will be closed if choosing 0min.

(c) Press MODE to enter next parameter setting or press ☼/ENTER to confirm and return to measurement mode.

(d) The default setting for auto. power off in DO mode is 0 min (refer to 9.1.2).

8.9.8 Restore to factory default setting (P7)

Picture (4-8)

(a) Short press MODE in P6 to enter P7, see picture (4-8).

(b) Press CAL or M+/RM to choose **"On**", meaning that parameters have been restored to the factory default setting mode, and the meter returns to measurement mode after 2 seconds.

9 Limited Warranty

We warrant this instrument to be free from defects in material and workmanship and agree to repair or replace free of charge, at option of APERA INSTRUMENTS, LLC, any malfunctioned or damaged product attributable to responsibility of APERA INSTRUMENTS, LLC for a period of THREE YEARS (SIX MONTHS for the electrode) from the delivery.

This limited warranty does not cover any damages due to:

Transportation, storage, improper use, failure to follow the product instructions or to perform any preventive maintenance, modifications, combination or use with any products, materials, processes, systems or other matter not provided or authorized in writing by us, unauthorized repair, normal wear and tear, or external causes such as accidents, abuse, or other actions or events beyond our reasonable control.

10 Appendix

10.1 Appendix 1 Content of Saturated Oxygen in Water at Different Temperature

Temperature ˚C	DO mg/L	Temperature ˚C	DO mg/L	Temperature ˚C	DO mg/L
0	14.64	16	9.86	32	7.30
1	14.22	17	9.66	33	7.18
2	13.82	18	9.46	34	7.07
3	13.44	19	9.27	35	6.95
4	13.09	20	9.08	36	6.84
5	12.74	21	8.90	37	6.73
6	12.42	22	8.73	38	6.63
7	12.11	23	8.57	39	6.53
8	11.81	24	8.41	40	6.43
9	11.53	25	8.25	41	6.34
10	11.26	26	8.11	42	6.25
11	11.01	27	7.96	43	6.17
12	10.77	28	7.82	44	6.09
13	10.53	29	7.69	45	6.01
14	10.30	30	7.56		
15	10.08	31	7.43		

10.2 Appendix 2 Content of Saturated Oxygen at Different Barometric pressure

Barometric pressure		Dissovled Oxygen Concentration (mg/L)		
mmHg	kPa	15˚C	25˚C	35˚C
750	100.00	9.94	8.14	6.85
751	100.13	9.96	8.15	6.86
752	100.26	9.97	8.16	6.87
753	100.40	9.98	8.17	6.88
754	100.53	9.99	8.18	6.89
755	100.66	10.00	8.20	6.90
756	100.80	10.01	8.21	6.91
757	100.93	10.03	8.22	6.92
758	101.06	10.04	8.23	6.93
759	101.20	10.07	8.24	6.94
760	101.33	10.08	8.25	6.95
761	101.46	10.09	8.26	6.96
762	101.60	10.11	8.27	6.97
763	101.73	10.12	8.28	6.98
764	101.86	10.14	8.30	6.99
765	102.00	10.15	8.31	7.00
766	102.13	10.16	8.32	7.01
767	102.26	10.18	8.33	7.02
768	102.40	10.19	8.34	7.02
769	102.53	10.21	8.35	7.03
770	102.66	10.22	8.36	7.04
771	102.80	10.23	8.37	7.05
772	102.93	10.25	8.39	7.06
773	103.06	10.26	8.40	7.07
774	103.19	10.28	8.41	7.08
775	103.33	10.29	8.42	7.09

Conversion between mmHg and kPa:

mmHg×0.13333=kPa

$DO_{pt} = P \times DO_t \div 760$

Note:

DO_{pt} — DO concentration under temperature t, Barometric pressure P, mg/L;

P — Barometric pressure, mmHg;

DO_t — DO concentration under temperature t, Barometric pressure 760mmHg, mg/L; 760 — Barometric pressure, mmHg.

10.3 Appendix 3 Content of Oxygen at Different Altitude

Altitude		Barometric pressure		DO	Altitude		Barometric pressure		DO
Foot	meter	kPa	mmHg	mg/l	Foot	meter	kPa	mmHg	mg/l
0	0	101.3	760	8.25	7500	2287	77.1	579	6.28
500	152	99.34	746	8.09	8000	2439	75.63	568	6.16
1000	305	97.6	733	7.95	8500	2591	74.44	559	6.06
1500	457	95.87	720	7.81	9000	2744	72.97	548	5.94
2000	610	94.28	708	7.68	9500	2896	71.64	538	5.83
2500	762	92.54	695	7.54	10000	3049	70.17	527	5.71
3000	915	90.95	683	7.41	10500	3201	68.84	517	5.61
3500	1067	89.35	671	7.28	11000	3354	67.38	506	5.49
4000	1220	87.75	659	7.15	12000	3659	66.58	500	5.42
4500	1372	86.15	647	7.02	13000	3963	65.78	494	5.36
5000	1524	84.56	635	6.89	14000	4268	64.98	488	5.29
5500	1677	83.09	624	6.77	15000	4573	64.18	482	5.23
6000	1829	81.63	613	6.65	16000	4878	63.38	476	5.16
6500	1982	80.03	601	6.52	17000	5183	62.58	470	5.10
7000	2134	78.56	590	6.40	18000	5488	61.79	464	5.03

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