OPERATION MANUAL

HAND HELD
CONDUCTIVITY METER

CE

Model:
- **8301**
- **8302**
- **8303**
- **8305**
- **8306**

INDEX

INTRODUCTION

Thank you for purchasing Conductivity Meters (8301/8302/8303/8305/8306). The standard package includes one meter , one temperature compensation probe (electrode) and four batteries.

Please read this manual thoroughly before operating your meter. You will find it is very easy to operate the instrument when measuring the conductivity value, TDS (Total Dissolved Solid) and Salinity.

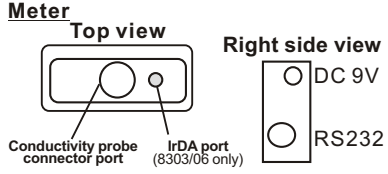
MATERIAL SUPPLIED

This package contains:

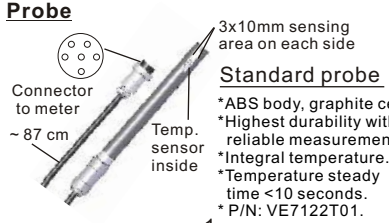
✓The meter x 1
✓The probe x 1 (protected by rubber cover)
✓Batteries AAA x 4pcs
✓Operation manual
✓Hard carrying case

PORTS & PROBE

Meter

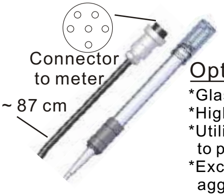


Probe



Standard probe

*ABS body, graphite cell.
*Highest durability with reliable measurements.
*Integral temperature.
*Temperature steady time <10 seconds.
* P/N: VE7122T01.



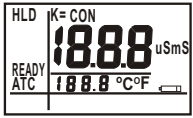
Optional probe

*Glass body, platinum cell.
*High performance model.
*Utilizes open loop design to prevent air trapping.
*Excellent for chemically aggressive samples.
*Integral temperature.
*Temperature steady time < 80 seconds.
*P/N: VE7113T01.

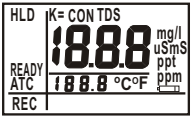
SPECIFICATIONS

MODEL NO	8301	8302	8303	8305	8306
Cond.uS/cm mS/cm	0~19.99uS/cm, 0~199.9uS/cm, 0~1999uS/cm o~19.99mS/cm, 0~199.9mS/cm				
RES.	0.05% full scale				
ACCURACY	+/-1% of full scale +1 digit (under good calibration)				
TDS RNAGE. ppm	N/A	0.00~19.99, 0.0~199.9, 0~1999	N/A	0.00~19.99, 0.0~199.9, 0~1999	
ppt	N/A	0.00~19.99, 0.0~199.9	N/A	0.00~19.99, 0.0~199.9	
TDS RES.	N/A	0.01/0.1/1ppm, 0.01/0.1pppt	N/A	0.01/0.1/1ppm, 0.01/0.1pppt	
ACCURACY	N/A	+/-1% of full scale +1 digit	N/A	+/-1% of full scale +1 digit	
TDS FACTOR	N/A	Conversion factor 0.40-1.00	N/A	Conversion factor 0.40-1.00	
TEMP. /RES.	0~80.0°C / RES: 0.1°C, 0.1°F				
ACCURACY	0.6°C(<50°C), 1°C(>50°C)				
CELL CONSTANT	0.1, 1.0, 10.0				
MEMORY	N/A	N/A	99 points	N/A	99 points
REAL TIME	N/A	N/A	YES	N/A	YES
IrDA PORT	N/A	N/A	YES	N/A	YES
MAN/MIN/AVG	N/A	N/A	YES	N/A	YES
TEMP. COEFFICIENT	0.0~10.0% per degree C				
NORMALIZATION TEMP.	15.0~30.0°C(adjustable)				
POWER	4xAAA batteries or DC 9V adaptor				
SALT	N/A	N/A	N/A	2~42ppt(KCL)	
ACCURACY				+/-1% of full scale +1 digit	
SALT RES.				0.1ppt	

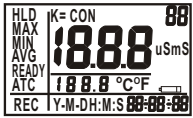
DISPLAY



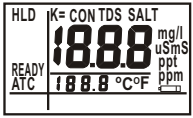
Model: 8301



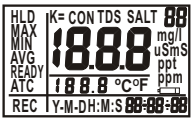
Model: 8302



Model: 8303



Model: 8305



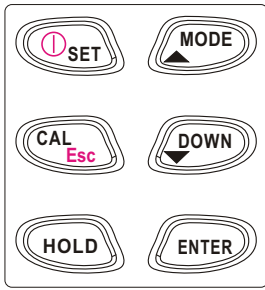
Model:8306

The meter will display all LCD segments when it is first turned on for approx. 3sec. The LCD is divided into five distinct sections.

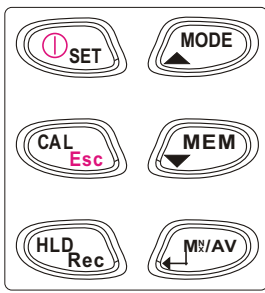
- The primary display shows the measured conductivity value (**CON**) in uS or mS per cm for all models (8301~8306).
  TDS in ppm or ppt is available for 8302/05/06.
  Salinity in ppt is available for 8305/06.
- The secondary display below the primary display shows the **temperature** of the reading for all models .
- **Year/Month/Date & Hour/Minute/Second** are displayed interchangeably at the bottom in the middle of the screen for model 8303 and 8306.
- **HLD(Hold)/Ready/ATC** are at the left side of the screen for all models .
- **MAX/MIN/AVG** are for model 8303/06.
- **REC (Recall)** is at the left bottom. **"88"** displays at the right top to indicate the occupied memory numbers in 8303/06.

KEY PAD OPERATION

8301,
8302,
8305



8303,
8306



1. ⏻ (**POWER**)**SET** key:
   Short press to turn on the meter when the meter is off. When the meter is on, press this key more than 2 seconds to enter setting (**SET**)mode. Press this key less than one second to turn off.

2. ▲ **MODE** key:
   In normal mode, press this key to switch Cond. & TDS (8302 &05); press to switch Cond., TDS & Salt (8303&06). In setting & recall mode, press this key to switch to different content.

3.**CAL/Esc** key:
In normal mode, press this key > 2 seconds to enter calibration mode. While the meter is in calibration, setting or recall mode, press this key (Esc) to return to previous mode.

4.**MEM** ▼(8303/8306 models only):
In normal mode, press this key to store the current reading with RTC(real time clock), the primary display will flash 3 times. The occupied memory number (88 on the top right corner) changes from xx to yy, eg: 00 to 01.(Fig. A& B)

In setting mode, press this key to change the setting content. Under recall mode, press this key to read memories.

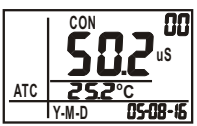


Fig.A(8306)

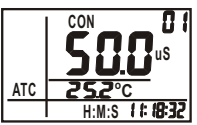


Fig.B(8306)

4-1.▼**DOWN**(8301/8302/8305 models):
Press this key to change the setting content in setting mode.

5.**HOLD** key (8301/8302/8305 models)
In normal mode, press the key < 1 sec. to hold the current reading, then short press this key again to unlock it .

5-1.**HLD/REC** (8303/8306 models):

In normal mode, press the key < 1 sec. to hold the current reading, then short press the key again to unlock it.

In normal mode, press the key more than 2 seconds to enter recall mode. (Fig. C)

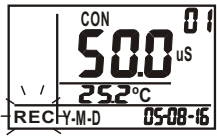


Fig. C(8306)

6. **ENTER** key (8301/8302/8305 models): To confirm the setting, calibration and so on by pressing this key.

6-1. ↵ **MI/MX/AV** key (8303/06 models): In normal and recall mode, press this key to view Max./Min./Ave. readings from power on or in memory.

In normal mode, press key > 2 sec. to clear the value. The whole LCD will flash for 2 seconds.

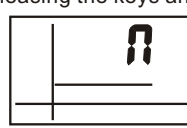
When in setting mode, press to enter content setting.

7. ⏻ **SET + ▲** :
When the meter is off, pressing these two keys simultaneously for more than one second to disable auto-sleep mode.

AUTO POWER OFF

The meter will be auto powered off in 20 minutes after last key operation. This sleep function is for battery power saving.

To disable this function, press **POWER** and **UP** keys at the same time until **"n"** display on LCD. Releasing the keys and meter will then enter normal mode with "non-sleep".



RECALL MODE (8303/06 ONLY)

In the normal mode, press **HLD Rec** more than 2 seconds to enter **RECALL (REC)** mode. Press **MIN/MAX/AV** to view Maximum, Minimum and Average of the memorized data in turns (Fig. D). You could also press **MODE** or **MEM** to review the memories one by one.

"REC" is flashing in recall mode. To leave recall mode, press **HLD Rec** more than 2 sec or short press **CAL Esc** to return to normal mode. LCD will show the last memory number which you had saved before you entered recall mode.

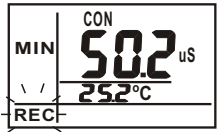


Fig. D(8306)

Press **MX/MN/AV** key when **REC** is flashing, so that the **MAX** value of the total memories will display. Press **MX/MN/AV** key again to view **MIN.** Press again to view **Average.** The top right corner record number will not be displayed during viewing **MX/MN/AV** because there might have more than one record with the same value.

REVIEW MODE (8303/06 ONLY)

In normal mode, press **MN/AV** key < 1sec. to view MAX, MIN, AVG from power on. These values will be clear after power off. You can press the **MN/AV** key > 2 second to clear these values (LCD will flash for 2 seconds). **NOTE: It is recommended to clear the values when measurement is stable.**

PREPARATION FOR CALIBRATION

Two issues need to be prepared and considered before operation. **First, what is the right calibration standard? Second, when should you calibrate?**

Selecting a calibration standard

For best results, select a conductivity or TDS (for model 8302/05/06) or NaCl (for model 8305/06) standard near the sample value you are measuring. Alternatively, use a calibration solution value which is approximate 2/3 of the full scale of the measurement range you plan to use.
For example, in the 0 to 1999 uS range, use 1413 uS solution for calibration.

DO NOT reuse the calibration solution. Contaminants in the solution will affect the calibration and the accuracy. Be sure to use fresh solution each time.

Please refer to below table. Strongly suggest to use the recommended solution for different conductivity and TDS ranges.

Conductivity measuring range		Recommended cal. solution range
1	0~19.99uS	6.00~17.00uS
2	0~199.9uS	60.0~170.0uS
3	0~1999uS	600~1700uS
4	0~19.99mS	6.00~17.00mS
5	0~199.9mS	60.0~170.0mS

TDS measuring range (factor=0.5)		Recommended cal. solution range
1	0.00~9.99ppm	3.00~8.50ppm
2	0.0~99.9ppm	30.0~85.0ppm
3	0~999ppm	300~850ppm
4	0.00~9.99ppt	3.00~8.50ppt
5	0.0~199.9ppt	30.0~85.0ppt

Model 8305/06 have a special built-in algorithm to linearize the measurement of Sodium Chloride concentration. So, for SALT calibration, you only need to do one point calibration.

The previous calibration data will be replaced after re-calibrating again. For example, if you previously calibrated conductivity meter at 1413 uS in the 0 to 1999 uS range, when you re-calibrate it at 1500 uS again (also in the 0 to 1999uS range), the previous 1413uS will be replaced in this range (0~1999uS). However, the meter will retain the calibration data for other ranges which are not yet re-calibrated.

If you use solution to calibrate **one** range and then manually input the cell constant again **P5.2**, cell constant of range1 to 5 will be all changed simultaneously .

NOTE:
The temperature coefficient of the meter is defaulted at 2.1% per ˚C (Fig. E) and provides good results for most applications. Please see Program **P4.1** on page 27 if you need to reset the coefficient.
You could also refer to **Appendix D** to calculate the temperature coefficient and determine the appropriate temperature coefficient for solution.

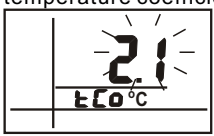


Fig. E (8306)

NOTE:
The default value of normalization temperature is 25 ˚C. If you need to

normalize to another value, please see Program **P4.2** on page 28(Fig. F). Before resetting this value, the calibration standard value of that normalized temp. must be known. (you could refer to the datasheet enclosed with your solution)

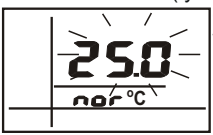


Fig .F (8306)

When should you do the calibration?

For first time using, strongly suggest you to use solution to calibrate or manually input the cell constant if solution is not available at that moment (refer to a label stick on the probe).
NOTE: for a complete kit, cell constant has been input into meter.
To completely calibrate the meter, it is suggested to clear all calibration data first. To erase all calibration data, please see **P7.1** on page 32 (Fig. G).

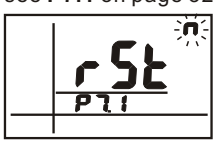


Fig .G (8306)

Cell Constant

If the conductivity of measured solutions are < 100µS, or TDS are < 50 ppm, please calibrate the meter at least once a week to get specified accuracy.

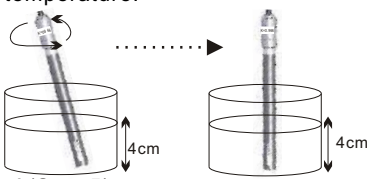
If the meter is used in the mid ranges, it is needed to do calibration at least once a month.

If the measurement is proceed at extreme temperature, we suggest to calibrate at least once a week.

CONDUCTIVITY CALIBRATION

Please follow up below steps to proceed the conductivity calibration:

1. Insert the probe into demineralized water or distilled water for about 30 minutes to rinse the probe.
2. Select the conductivity standard for calibration. (See page 8)
3. Pour 4 cm height of the solution into two separate clean containers(A&B).
4. Power on the meter. Full LCD will display for a three times and then get into the normal measurement mode.
5. Rinse the probe into one of above containers. Gently stir the probe.
6. Dip the rinsed probe into the other container. Tap probe on the bottom of container to remove air bubbles. Let the probe stabilize to the solution temperature.



A(Step 5) B(Step 6)

7. Press **CAL** key more than2 seconds to enter calibration. The probe will automatically detect the conductivity value of solution and blinks the value on the LCD (Fig. H)

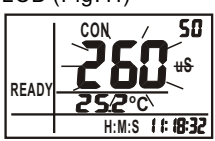


Fig .H (8306)

8. Press the **UP/DOWN** keys to change the value on the primary display to match the value to the standard which is referred to normalization temp. 25°C You can adjust the conductivity reading up to ±20% from the detected value. However, if your detected value and standard value differs by more than ±20%, it means cleaning or replacing probe is needed.
For example:
Standard: 10uS; Detected value:19uS
Adjustable range: ±3.8us (19*20%)
However, under above situation, the values already differed over 20%.

NOTE:
When the calibration is stable, the "Ready" will display on the LCD. If you don't find "Ready" display, please check the calibration solutions and make sure : is the solution stable? is the input value in step 8 correct.

NOTE:
Cell constant may degrade with time and usage. User can use this feature as a reminder of changing a new probe.

NOTE:
The meter will automatically detect the solution, If the standard value is over the measuring limit or less than 10% of measuring limit, the displayed value will equal to the range limit or 10% of range limit. Under this situation, user should go to parameter setting first to manually select a suitable range. (**P1.0**, see page 23).

For example 1:
Standard: 22uS; Detected value:19uS
Adjustable range: ±3.8us (19*20%)
Although the values differ less than

20% but the 22uS is already over range limit so the maximum value could be input is 19.99uS only. To exactly adjust the value to 22uS, please manual select the range as 0~199.9 in **P1.3**

For example 2:
Standard: 1.6uS; Detected value:2.1uS
Adjustable range: ±0.42us (2.1*20%)
Although the values differ less than 20% but the 1.6uS is already less than 10% range limit (1.99) so the max. value could be input is 1.99uS.

9. After "Ready" is displayed, press "**ENTER**" to confirm the calibration. The LCD will stop flashing and the meter will switch back to normal measurement mode.
10. Repeat 1~9 for other ranges if needed.

NOTE:
When switch the meter from measurement to calibration mode, due to the meter will auto defect the solution value based on the previously selected cell constant (0.1,1.0 or 10), so, sometimes the display in primary display may seem to jump to the auto defected value after entering calibration. This means that even in the same solution, if the displayed values in measurement and calibration mode are different, this is not abnormal.

NOTE:
To exit conductivity calibration mode without confirming calibration, **DO NOT** press the ENTER key in step 9. Press **Esc** instead and this will make you retain the meter's previous calibration data for the current range which you proceed.

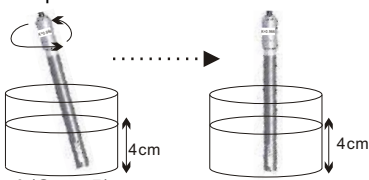
TDS CALIBRATION (Model:8302/05/06)

There are two options for you to do the TDS calibration.

Option1: Using TDS standards

Please follow up below steps to proceed the calibration:

1. To insert the probe into demineralized or distilled water for about 30 minutes in order to rinse the probe.
2. Select the TDS standard for calibration. The factory default setting of the TDS conversion factor is 0.50. If your solution has a different TDS factor, you can improve the calibration accuracy by setting the TDS factor before starting the calibration.
   To converse the TDS factors to the correct value, please see Appendix B or refer to the value provided by standard solution manufacturer.
3. Pour 4 cm height of the solution into two separate & clean containers.(A&B)
4. Turn on the meter. The full LCD will display for three times. Press the **MODE** key to select TDS mode.
5. Rinse the probe into one of the containers. Gently stir the probe.
6. Dip the rinsed probe into the other container. Tap the probe on the bottom of container to remove air bubbles. Let the probe stabilize to the solution temperature.



7. Press **CAL** key for more than 2 sec. To begin the calibration. The TDS value will blink on the LCD.(Fig. I)
8. Press the **UP/DOWN** keys to change the value on the primary display to match the value to the standard solution. You could refer to your solution normalization temperature. The meter is defaulted at 25°C

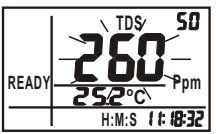


Fig .I (8306)

NOTE: Please refer to the three key notes in page 12&13

9. After " Ready" display, pressing "**ENTER**" to confirm the calibration. The LCD will stop flashing and the meter will switch back to TDS measurement mode.
10. Repeat 1~9 for other ranges if needed.

Option2: Using Conversion Factors

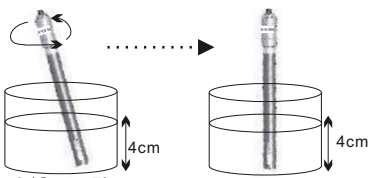
TDS values are related to conductivity. You can calibrate the meter by using conductivity standards as described above and then program the meter with a given conversion factor. Please refer to below steps:

1. Perform the conductivity calibration procedure on page 11~13.
2. Select the correct Conductivity-to-TDS conversion factor. You can refer to Appendix B or calculate the TDS conversion factor for other solutions using the formula show in Appendix C
3. Refer to **P2.1** (in page 25) to check the procedures of how to set the factor.

SALT CALIBRATION (Model:8305/8306)

Please follow up below steps to proceed the salinitycalibration:

1. Insert the probe into demineralized or distilled water for about 30 minutes to rinse the probe.
2. Select the Sodium Chloride standard for calibration. 10~40ppt is suggested.
3. Pour 4 cm height of the standard into two separate & clean containers.(A&B)
4. Turn on the meter. The full LCD will display for three times. Press **MODE** key to switch to SALT mode.
5. Rinse the probe in one of the containers. Gently stir the probe. Rinsing could remove contaminants that affect the calibration and could prevent error.
6. Dip the rinsed probe into the other container. Tap the probe at bottom of container to remove air bubbles. Let the probe stabilize to the solution temperature.



A(Step 5) B(Step 6)

7. Press **CAL** >2 sec. to begin the calibration. The SALT value will blink on the LCD.(Fig. J)

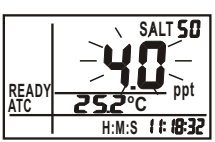


Fig .J (8306)

8. Pressing the **UP/DOWN** keys to change the value on the primary display to match the value to the calibration standard.
   You can adjust the SALT reading up to ±20% from the detected value. If the detected value and standard values differs by more than ±20%, it means clean or replace probe is needed.
   The maximum value could be input is 50ppt and the minimum one is 1ppt.
9. When "Ready" display on LCD, user could press "**ENTER**" to confirm the calibration. The meter will switch back to SALT measurement mode.
   NOTE: To get high accuracy in Conductivity &TDS measurement, we strongly recommend you to do conductivity or TDS calibration again before measuring Conductivity or TDS if you have proceeded salt calibration.

CONDUCTIVITY MEASUREMENT

Range Selection (For COND. & TDS)

The meter is default at "auto-ranging" mode. Auto-ranging mode will determine and select the range which gives you the greatest resolution and accuracy. Alternatively, you can manually select one of the five ranges in setup mode **P1.0** (see page 23).
Example: if you prefer the meter to display a reading as 0.50 mS rather than 500 uS, you could select the "0 to 19.99 mS" range by the manual ranging function.

The meter will be reset to auto-ranging mode once it is powered off.

NOTE:
Accuracy is a percent of full-scale, so using your meter in the lowest range could bring your measurement the greatest accuracy.

Automatic Temperature Compensation (For COND. & TDS)

To measure with automatic temperature compensation, please follow up below steps:

1. Turn on the meter. The text "ATC" should be displayed on the left -bottom corner of the LCD. If the ATC indicator doesn't appear, it means the manual temperature compensation may be selected already in setting mode. See **P2.4** on page 26 for the instruction of selecting Automatic Temperature Compensation.

2. Set the temperature coefficient to the right value.

All meters are factory default to 2.1% per°C (temperature coefficient) and this will provide good results for most applications. You may see **P4.1** on page 27 if you need to set the temp. coefficient to a different value.

3. Select the normalization temperature. All meters are factory defaulted to 25℃(normalization temp.). If you need to set the value, please see **P4.2** on page28.

4. Press **Esc** to switch back to normal mode. Rinse the probe with deionized or distilled water before using to remove any impurities adhering to the electrode body.
   If the electrode isn't used for a long time, please soak probe for more than 30 mins. to clear up the lazy effect of the probe.

5. Dip the probe into the sample. Make sure there are no air bubbles trapped on the slot of the probe. To remove air bubbles, stir the probe mildly and make sure the electrode tip is submerged.

6. Stir the probe gently in the sample to create a homogenous sample. Allow a few seconds for the temperature reading to approach the solution temperature.

7. Take readings. When the reading is stable, "READY" will be displayed on the left-middle LCD.

Manual Temperature Compensation (For COND. & TDS)

To measure with manual temperature compensation, please follow up below steps:

1. Power on the meter. Press **SET** key more than one second to enter setting mode. Please refer to **P2.4** (page 26) to disable the ATC function of meter.

2. To set a manual temperature compensation value. Please see **P4.3** on page 29.

3. To switch the meter back to normal mode. The middle region of LCD will display a fixed temperature that you input, the text ATC won't be displayed. Now, you could start the measurement follow steps 4-6 on page 19.
   NOTE:
   Manual Temperature Compensation only could be selected when the ATC is off. For non-compensated measurements, change the temp. coefficient to 0.0%.(Fig. K)

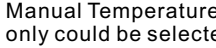


Fig. K

TDS MEASUREMENT

Please follow up below steps to proceed the TDS measurement.

1. Power on the meter.
2. Set the TDS conversion factor to a correct value. The factory default value of the TDS conversion factor is 0.50. Please refer to **P2.1** on page 25

For conversing TDS factor to correct value, see Appendix B &C on page 41.

3. Select Range, automatic temperature compensation or manual temperature compensation per your application by following up page18~20

4. Start to take readings. Press "**MODE**" to switch the meter to TDS mode and then get the reading from LCD.(Fig. L)

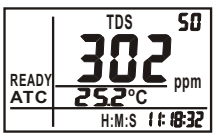


Fig. L

SALINITY MEASUREMENT

When the meter in SALT mode, below terms are all fixed under this mode:

*Built-in NaCL conductivity to TDS conversion factor.

*Temp. Coefficient.

*Normalization Temp. (fixed at 25°C)

1. Taking measurements with READY indicator selected on:

If the READY indicator is activated, the READY annunciator display when the reading is stable. (Fig. M) Switch the READY indicator on or off in **P 2.2** per your applications (Please see page 25).

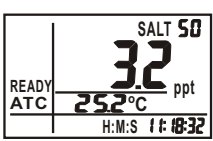


Fig.M

2. Taking measurements with the auto endpoint feature selected on:

When a reading is stable for more than 5 seconds, the auto endpoint feature will automatically "hold" the reading. The "HLD" indicator appears on the left-top of the LCD. Press the HOLD key to release the reading. (Fig. N)

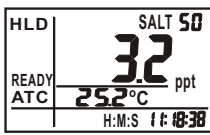


Fig.N

Switch the Auto endpoint feature on or off in **P 2.3** per your preference. (Please see page 26)

NOTE:
READY indicator and auto endpoint features are available for COND., TDS and Salt modes.

PARAMETER SETTING

1. When the meter is in the normal mode, press **SET** key more than two seconds to enter to setup mode.
2. Press ▲or▼ to switch the setting parameter one by one.
3. Press **ESC** key to return to previous status.
4. Press **ENTER** to enter each parameter setting as following:

a) P0.0: Print (**Prn**, 8303/06 only)

At P0.0, pressing **ENTER** to P0.1. The "Prn" text will flash to indicate the meter is transmitting the memories through IrDA port to another device. (Fig. O)

Make sure you have followed the pictures on page 28 (IrDA printer to meter). IrDA port to port should be in less than 30 degree angle.

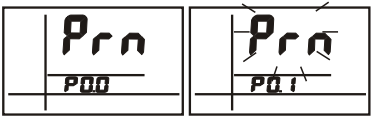


Fig. O

b) P1.0: manual range setting (rAn)

Normally, the meter will automatically select a range when readings appear. The purpose of having manual ranging function is for you to select the specific range (and corresponding resolution) that you want to work in. This function is for COND.& TDS measurement. The range of SALINITY is fixed.

There are 5 ranges for you to select. Pressing **UP** or **DOWN** keys to select the ranging function, rAn. (Fig.P). When you see P1.0, press **ENTER** to

enter setting. The text of the central LCD will flash.

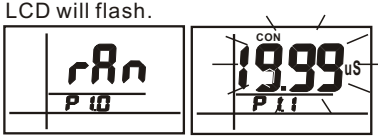


Fig. P

Pressing **UP** or **DOWN** key to select from P1.1 to P1.5 and then press **ENTER** to save.

NOTE: When press **ENTER** to select P1.1or other ranges, LCD will flash the limit value (Fig. P). Press **ENTER** key to confirm and the meter will return to normal measure mode.

The LCD will display E03 if the measured conductivity/TDS values are beyond the limit value. You need to select the measure range again when it is over the range.

The meter will be reset to the Auto-ranging function once it is turned off. So, user need to set the manual ranging function each time when the meter is powered on again.

Type		Range		
		Cell Constant =0.1	Cell Constant =1.0	Cell Constant =10
P1.1	Ist Range	0~1.99uS/ppm	0~19.99uS/ppm	0~199.9uS/ppm
P1.2	2nd Range	0~19.99uS/ppm	0~199.9uS/ppm	0~1999uS/ppm
P1.3	3rd Range	0~199.9uS/ppm	0~1999uS/ppm	0~19.99mS/ppt
P1.4	4th Range	0~1999uS/ppm	0~19.99mS/ppt	0~199.9mS/ppt
P1.5	5th Range	0~19.99mS/ppt	0~199.9mS/ppt	0~1999mS/ppt

c)P2.0: Meter configuration: (CoF)

P2.1: TDS factor: (tdS, 8302/05/06)
The concentration of dissolved salts in solution increases the conductivity. This effect varies from salt to salt and is roughly linear in a given range for a given salt. The TDS conversion factor is a value used by the meter to convert from conductivity to TDS.

After selecting P2.0, press **ENTER** to select P2.1. Press again to enter P2.1. TDS factor flashes on the LCD (Fig. Q). You can press **UP/DOWN** to change the value from 0.40 to 1.00. The default value is 0.50.Press **ENTER** to confirm the TDS factor and select P2.2 automatically.

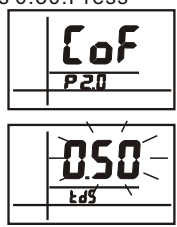


Fig. Q

P2.2: READY indicator:(rdy)

P2.2 lets you select **READY** indicator "on" to remind you the measurement is stable. You might also select READY indicator "off" for faster response. Press **UP/DOWN** to switch ready function to "on" or "off". (Fig. R) Press **ENTER** to confirm the last state and select P2.3 automatically.

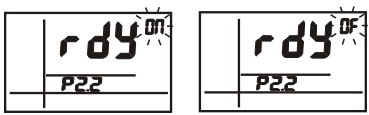


Fig. R

P2.3: Auto endpoint function:(AEP)
P2.3 lets you switch on or off the "Auto endpoint function". Select auto endpoint to "on" could **HOLD** your measurement when it is stable for more than 5 seconds. The display value will freeze and **HLD** indicator will appear on the LCD. Press the **HLD** key again to release the display.

Select the auto endpoint to "off" could deactivate this feature. Press **UP/DOWN** to switch auto endpoint function on or off (Fig. S). Press **ENTER** to confirm the last state and select P2.4 automatically.

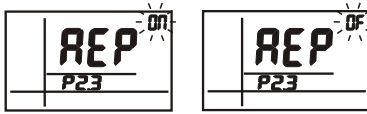


Fig. S

P2.4: ATC or non-ATC: (Atc)
P2.4 allows you to select Automatic or Manual Temperature Compensation. The default is ATC.
Press **UP/DOWN** to switch automatic temperature compensation on or off (Fig. T).
Press **ENTER** to confirm the last state and return to P2.0.

NOTE: To be summarized, the meter default is **"Ready Indicator on", "auto endpoint function off" & "ATC on"**

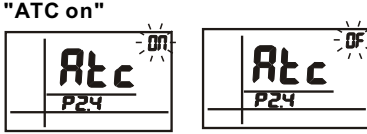


Fig. T

d) P3.0:Unit :(Unt)

P3.1 selecting℃ or℉:(t)

Select P3.0 and press **ENTER** to enter P3.1.

Press **UP** or **DOWN** key to switch ℃ or ℉. Press **ENTER** again to confirm the last unit and then enter P3.2 automatically. (Fig. U)

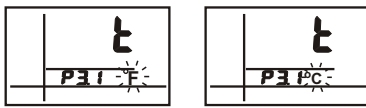


Fig U

P3.2 selecting ppm or mg/L: (tdS)

After entering P3.2 from P3.1, the TDS unit(mg/l or ppm) will flash on the LCD. The default unit is ppm.

Press **UP** or **DOWN** key to switch ppm or mg/l, Press **ENTER** again to confirm the last unit and return to P3.0.(Fig. V)

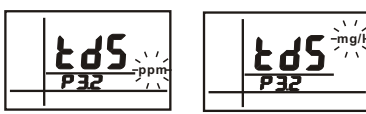


Fig V

e)P4.0: temperature parameters: (t)

P4.1: Temperature coefficient:(tCo)

The temp. coefficient (expressed as percent per ℃) is the changed ratio of conductivity per degree of temp.. By using a suitable temp. coefficient for solution could let you accurately compensate temp. for most solution. The adjustable range is 0.0 per ℃ to 10.0 % per ℃. The default is 2.1% per℃. 0.0% has no effect on temperature so the displayed value is the same as actual temperature.

Select P4.0 and press **ENTER** to select P4.1. Press **ENTER** again and Temperature Coefficient will flash on the LCD. Press **UP/DOWN** to change the value from 0.0 to 10.0, the unit is %/°C (Fig. W). Press **ENTER** to confirm the last value and select P4.2 automatically.

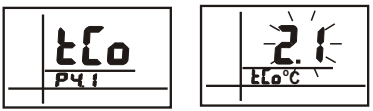


Fig W

P4.2: Normalization temperature: (nor)

The meter will normalize its cond. measurement to a standard temp. which you preset.

User can adjust the normalization temp. from 15 to 30 °C (59 to 86 °F). Meter is defaulted at 25 °C (77°F). After pressing **ENTER**, the normalization temperature will flash on the LCD. Press **UP/DOWN** to change the value from 15.0 to 30.0 °C (59.0~86.0°F).(Fig. X)
Press **ENTER** to confirm the last value and select P4.3 automatically.

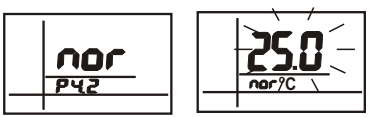


Fig X

NOTE: To know more about the temperature effect on on measurement, please refer to Appendix D in page 43 for the details.

P4.3: Manual temp. Compensation: (Int)

When you disable the ATC and select manual temperature compensation, you need to manually enter the temp. value of solution into the meter. You can select any temperature between 0°and 50°C (32 to 212°F). The default is 25°C (77°F).

Press **ENTER** to enter P4.3 from P4.2, the default manual input temperature will flash on the LCD.
Press **UP** to select the flashing value from 0~9.(Fig. Y)
Press **DOWN** to select the edit digit. Adjustable range is from 0.0~50.0°C (32.0~122.0°F). The default is 25.0°C (77.0°F).
Press **ENTER** to confirm the last input and return to P4.0.

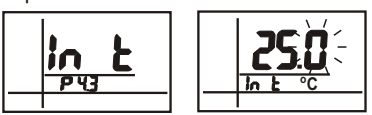


Fig Y

f)P5.0: CELL setting: (CEL)

P5.1: Cell Constant:(SEL)

- The cell constant, K, could be 1.0, 10, or 0.1.
  To use Cell Constant = 1.0 for midrange measurements.
  To use Cell Constant = 10 for high range measurements (above 20 mS or 10 ppt)
  To use Cell Constant = 0.1 for low range measurements (below 20 µS or 10 ppm)

Using correct cell constant is important to obtain the optimal reading in various ranges of measurement. Refer to below table for suggested K values.

Ranges available COND./TDS (Factor=0.5)	K=0.1	K=1.0	K=10
0.00~19.99uS/0~9.99ppm	*	*	
0.0~199.9uS/0~99.9ppm	*	*	
0~1999uS/0~999ppm		*	
0.00~19.99mS/0~9.99ppt		*	*
0.0~199.9mS/0.0~99.9ppt		*	*

NOTE: The cell constant of probe sold with this meter is near K=1.0. To purchase K=0.1 or K=10 probes, please call your local distributors.

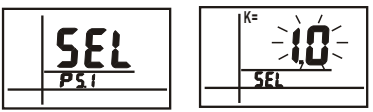


Fig Z

Select P5.0 and press **ENTER** to enter P5.1. Press **ENTER** again and cell constant value will flash on the LCD. Press **UP/DOWN** to switch the value from 0.1,1.0,10.0 one by one. The default value is 1.0. (Fig. Z) Press **ENTER** to confirm the last input and select P5.2 automatically.

NOTE:
When using a cell constant K = 0.1, the measured range will be only 1/10 of the range which measured by K=1. So, the lowest range will be 0~1.99us (0~0.99ppm). Due to only 5 ranges are available, the highest range will only be 0~19.99mS (0~9.99ppt).

When using a cell constant K = 10, the measured range will be 10 times of the range which measured by K=1. So, the highest range will be: 0 to 1999 mS (0.0 to 999 ppt). Due to only 5 ranges are available, the lowest range will be 0 to 199.9uS (10.0 to 99.9 ppm)

P5.2: Input the cell constant:(InPt)

If constant K=0.1/1/10 could not completely meet your need, you can input the cell constant after selecting the K=0.1, 1 or 10.

For example: if K=0.992

After saving P5.1, the P5.2 will be selected. Press **ENTER** again to enter P5.2.The cell constant (0.1 or 1 or 10) will flash on the LCD.

Press **UP** to select the flashing value from 0~9. (Fig. AA)

Press **DOWN** to change the flashing digit.

The selectable range is ±20%of cell constant which is selected in P5.1.

Press **ENTER** to confirm the last value and return to P5.0.

NOTE: After inputting cell constant, all calibration information in P8.0 will be clear. Manual input Cell Constant will change all the constant in range 1~5 at the same time.

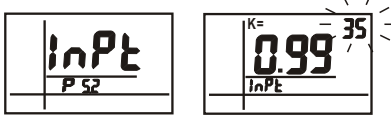


Fig. AA

g).P6.0: Memory Clear: (Clr, 8303/06**)**

P6.1: Memory clear(CLr)

Use this function to clear all stored memory when you need to store a new series of values. This function lets you avoid confusing the old values with the new ones.

In P6.0, press **ENTER** to enter P6.1.

Press **UP/DOWN** to select "n"-NO or "y"-YES, then press **ENTER** to confirm and the meter will return to P6.0. (Fig. AB)

If the memory is full, you must clear all values for continue recording. If not, when you record the 100th value, the "FuL" will flash on primary LCD for three times.

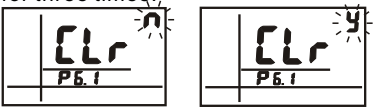


Fig. AB

h)P7.0:Reset to factory default setting(rSt)

P7.1: Meter reset (rSt)

P7.1 lets you reset all parameters to factory default settings. This function will clear all calibration data and any other setup functions which you have done. However, it will not clear clock settings & memory.

In P7.0, press **ENTER** to enter P7.1.

Press **UP/DOWN** to select "**n**"-NO or "**y**"-YES. (Fig. AC)

Press **ENTER** to confirm and then return to P7.0.

NOTE: Refer to **Appendix A** to review the default parameter of meter. To completely recalibrate a meter or using a replacement probe, it is best to clear all calibration data in memory.

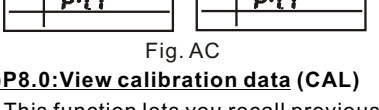


Fig. AC

i)P8.0:View calibration data (CAL)

This function lets you recall previous calibration data and could help you know when is needed to re-calibrate the meter. This function is made for "Review" purpose only.

In P8.0, press **ENTER** to enterP8.1, User can press **UP/DOWN** key to change to P8.X.Ex:**UP** key to enter P8.2 or **DOWN** key to return P8.0. P8.1 is calibration data for range 1 P8.2 is for range 2, ... P8.5 is for range 5. (Fig. AD)
For model 8301/02/05, calibration data is the only data displayed in the mid.of LCD while in 8303/06, cali. data and date (Y-M-D HH:MM:SS) are both displayed.

If there is no previous calibration data at a particular range, the primary display will show " ---"

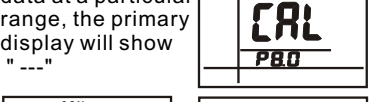


Fig. AD

J)P9.0:Electrode data:(ELE)

This mode has five options for you to check the probe cell constant value for diagnostic purposes.
If no solution calibration proceed, the cell constant value will be equal to the value in P5.2 for 5 ranges. If solution calibration is proceeded in specific range after P5.2 setting, the cell constant in specific range is adjusted according to your calibration.

In P9.0, press **ENTER** to enter P9.1. Press **UP/DOWN** key to change to P9.X (P9.1~P9.5).Ex: **UP** key to enter P9.2 or **DOWN** key to enter P9.0 (Fig. AE).P9.1 is the cell constant value for range 1. P9.2 is for range 2, ... P9.5 is for range 5

Fig. AE

k)PA.0:RTC Setting:(**rtc**, model:8303/06)

Press ↵ to PA.1,press ▲or▼ to set Year.
Press ↵ to PA.2,press ▲or▼ to set Month.
Press ↵ to PA.3,press ▲or▼ to set Day.
Press ↵ to PA.4,press ▲or▼ to set Hour.
Press ↵ to PA.5, press ▲or▼ to set Minute.
Press ↵ to PA.6,press ▲or▼ to set Second.

The procedure lets you set Y-M-D first after every selection, press ↵ to confirm the values, next digits will be flashing until you press ↵ to save it. After setting Y-M-D, user then may set H:M:S,the first digits will be flashing until pressing ↵ to confirm (Fig.AF).

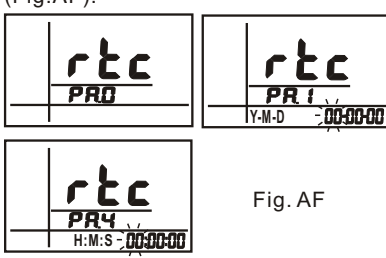


Fig. AF

MAINTENANCE & STORAGE

a)Make sure the electrode is clean

Between measurements, rinse the electrode with de-ionised water. If the electrode has been exposed to a solvent that is immiscible with water, clean it with a solvent miscible with water, e.g. Ethanol and rinse carefully with water.

b)Store the conductivity cell carefully

Before storing the electrode, rinse it carefully in de-ionised water.

Short-term storage: In de-ionised water.

Long-term storage: In de-ionised water or store dry.

After long-term storage, leave the electrode in de-ionised water for 8 hours before use.

c) Handle platinised cells carefully

Do not touch the black platinum layer of the platinized cells.

To rinse the platinized cells, it is recommended to dip the cell several times in a beaker with demineralised water.

Be careful when rinsing platinized cells by deionised water from a water bottle. The force of water might remove some of the platinum layer and consequently chanage the cell constant.

TROUBLESHOOTING

a) Power on but no display:

1) Make sure the time of pressing power key is more than 100 mS.
2) Check the battery are in place and make sure good contact and correct polarity.
3) Replace new batteries and try again.
4) Remove the battery for one minute and then put them back again.

b) Display disappear:

Check whether the low battery indicator is displaying before the LCD disappears, if yes, replace with new batteries.

c) E01:

The probe is disconnected or damaged.

d) E02:

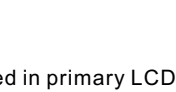
The measured value is below the range limit.

e) E03:

The measured value is over the range limit.

f) E04:

The value displayed in primary LCD is not correct and this is caused by above E01~E03.



g) E32:

IC memory error.

h) E41:

Meter configuration error. For example: the temperature coefficient is over the setting limit.

OPTIONAL ACCESSORIES

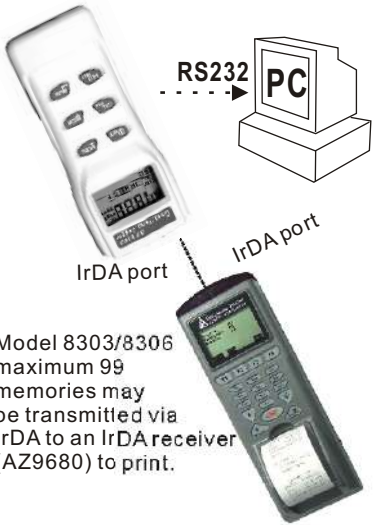
✓RS232 cable /software
✓IrDA 9680 data receiver & printer
(Inclusive of a paper roll and batteries)
9680 can be used to receive any AZ IrDA like meters.
9680 features 3 receiving modes:
a) Single receiving b) Multiple & manually receiving c) Datalogging function, automatically record
✓Printing paper roll for 9680 model
✓IrDA 9660 data receiver (w/o printer)
✓Additional replacement probe
✓AC to DC 9V adaptor
✓Platinum cell electrode
Contact the store you purchased the meter for above accessories.

WARRANTY & RETURN

The meter is warranted to be free from defects in material and workmanship for a period of one year from the date of purchase. This warranty covers normal operation and does not cover battery, misuse, abuse, alteration, tampering, neglect, improper maintenance or damage resulting from leaking batteries. Proof of purchase is required for warranty repairs . Warranty is void if the meter has been opened .

Authorization must be obtained from the supplier before returning items for any reason. When requiring a RA (Return Authorization), please include data regarding the defective reason, the meters are to be returned with good packing to prevent any shipment damage and insured against possible damage or loss .

IrDA TRASMISSION (8303/06)



1.Ir protocol: It is compatible with SIR, 19200 bps, 8 data bits, no parity.

2.Data Format: (Transmitting every second)

8303:

C***. **uS(mS):t***.*C(F) @****-**-** **:**:**LRCCRLF

8306:

C***. **uS(mS):t***.*C(F):D***. **ppm(ppt): S***. * ppt @****-**-** **:**:**LRCCRLF

The error message format is:ExxNul

xx: stands for error code.

3. Format of description

Format of description is transmitting every 15 records.

8303: $CON:TEMPLRCCRLF

8306: $CON:TEMP:TDS:SALTLRCCRLF

RS232 OUTPUT: (9600 bps)

The meter can link with personal computer to capture on-line data, ,display COND./TDS/SALT readings with real-time output, you can retrieve file, save the data for operating data analysis, record statistics ,.... versatile functions for your choice.

Connection procedures:

1. Plug the optional accessory RS232 cable onto the RS232 jack port (at the right side of the meter)
2. Instert the D-sub 9P type connector onto computer's Com.1 or 2 port or....
3. Start to set up RS232 software by inserting the CD-ROM.
4. When installing the RS232 software ,please follow the procedure on operation manual which is enclosed in the software package.
5. RS232 Protocol:
   9600 bps, 8 data bits, no parity.
6. Data Format:
   Tx. ASCII code sent by each second while meter is on:

8301:
C***.**uS(mS):t***.*C(F)LRCCRLF

8302:
C***.**uS(mS):t***.*C(F):D***.**ppm(ppt)LRCCRLF

8303:
C***.**uS(mS):t***.*C(F)@****-**-****:**:**LRCCRLF

8305:
C***.**uS(mS):t***.*C(F):D***.**ppm(ppt):S***.*pptLRCCRL

8306:
C***.**uS(mS):t***.*C(F):D***.**ppm(ppt):S***.*ppt
@****-**-****:**:**LRCCRLF

The error message format is : ExxNul
xx: stands for error code.

7. Memory data is not available via RS232.

Appendix A: Meter Factory Default Setting

Type	Parameters	Default	Remark
P0.1	IRDA Output		Only 8303/06
P1.1 P1.2 P1.3 P1.4 P1.5	Manual range setting	OFF OFF OFF OFF OFF	The meter resets to the Auto-ranging function once it's turned off
P3.1 P3.2	Select℃/℉ Select ppm or mg/L	℃ ppm	Temp unit TDS unit (only 8302, 8305,8306)
P4.1 P4.2 P4.3	Temp. coefficient Nor. Temp Manual compensation temp.	2.1%/℃ 25℃ 25℃	Adjustable from 0.0 to 10% Adjustable from 15 to 30℃ Adjustable from 0~50.0℃
P5.1 P5.2	Cell const. Select Cell const. Input	1.0 1.0	Select K=1.0, 0.1 or 10 The input cell constant offset is ±20% of select cell constant in **P5.1**
P6.1	Clear Memory	NO	Retain Memory
P7.1	Factory default	NO	Retain your current settings
P8.1 P8.2 P8.3 P8.4 P8.5	Viewing previous calibration data	--- --- --- --- ---	No calibration data for 1st range No calibration data for 2nd range No calibration data for 3rd range No calibration data for 4th range No calibration data for 5th range
P9.1 P9.2 P9.3 P9.4 P9.5	Viewing probe data	--- --- --- --- ---	No offset for effective cell constant (1st range) No offset for effective cell constant (2nd range) No offset for effective cell constant (3rd range) No offset for effective cell constant (4th range) No offset for effective cell constant (5th range)
PA.1 PA.2 PA.3 PA.4 PA.5 PA.6	Real time clock. Only 8303, 8306	NO	Retain year of current RTC. Retain month of current RTC. Retain day of current RTC. Retain hour of current RTC. Retain minute of current RTC. Retain second of current RTC.

Appe ndi x B: Cond uctivity to TDS Conv ersion Factors

Conductivity at 25℃	TDS KCl		TDS NaCl		TDS 442	
	ppm value	Factor	ppm value	Factor	ppm value	Factor
23 μS	11.6	0.5043	10.7	0.4652	14.74	0.6409
84 μS	40.38	0.4807	38.04	0.4529	50.5	0.6012
447 μS	225.6	0.5047	215.5	0.4822	300	0.6712
1413 μS	744.7	0.527	702.1	0.4969	1000	0.7078
1500 μS	757.1	0.5047	737.1	0.4914	1050	0.7
2070 μS	1045	0.5048	1041	0.5029	1500	0.7246
2764 μS	1382	0.5	1414.8	0.5119	2062.7	0.7463
8974 μS	5101	0.5685	4487	0.5	7608	0.8478
12,880 μS	7447	0.5782	7230	0.5613	11,367	0.8825
15,000 μS	8759	0.5839	8532	0.5688	13,455	0.897
80mS	52,168	0.6521	48,384	0.6048	79,688	0.9961

442: 40% sodium sulfate, 40% sodium bicarbonate and 20% sodium chloride.

Appendix C: Calculating TDS conversion factors

The meter can be calibrated by using TDS calibration standard solutions. The calibration standard requires the TDS value at a standard temperature such as 25℃. To determine the Conductivity-to-TDS conversion factor, please use the following formula:

Factor = Actual TDS÷ Actual Conductivity @ 25℃

Definitions:
Actual TDS: Value from the solution bottle label or from a standard buffer which made by using high purity water and precisely weighed salts.
Actual Conductivity: Value measured using a properly calibrated Conductivity/TDS/Temperature meter.

Both the actual TDS and the actual conductivity values must be in the same magnitude of units. For example, if the TDS value is ppm, the conductivity value must be in uS; if the TDS value is in ppt, the conductivity value must be in mS.

Check this number by multiplying the conductivity reading by the factor in the above formula and the result is the TDS in ppm.

Appendix D: Temperature Effect

Conductivity measurements are temperature dependent, if the temperature increases, conductivity increases. eg: the conductivity measured in a 0.01 M KCl solution at 20° C is 1.273 mS/cm, whereas, at 25 °C, it is 1.409 mS/cm.

The concept of reference temperature (Normalization temperature) was introduced to allow the comparison of conductivity results obtained at different temperature. The reference temperature is usually 20° C or 25° C. The conductivity meter measures the actual COND. and temperature and then converts it to the reference temperature using a temperature correction function and displays the conductivity at the reference temp.. It is mandatory to always associate the temperature together with a conductivity result. If no temperature correction is applied, the conductivity is the value taken at measurement temperature. The 830x meter used linear temperature correction.

Linear temperature correction:
In moderately and highly conductive solutions, temperature correction can be based on a linear equation involving a temperature coefficient (θ). The coefficient is usually expressed as a conductivity variation in %/ ° C.
Linear temperature correction is used, e.g. for saline , acids and leaching solutions.

$$K_{Tref}=\frac{100}{100+\theta\bullet(T-T_{ref})}\bullet K_T$$

where:
$K_{T_{ref}}$ = Conductivity at Tref
K_T = Conductivity at T
T_{ref} = Reference temperature
T = Sample temperature
θ = Temperature coefficient
Note: the correction is accurate only within a limited temperature range around T1 and T2. The greater the difference between T and Tref, the higher the risk of error.

Calculating Temperature Coefficients (θ)
By measuring the conductivity of a sample at temperature T1 close to Tref and another temperature T2, you can calculate the temperature coefficient by using the following equation:

$$\theta = \frac{(K_{T2}-K_{T1})\bullet 100}{(T_2-T_1)\bullet K_{T1}}$$

T2 should be selected as a typical sample temperature and should be approximately 10℃ different from T1. The temperature coefficients of the following electrolytes generally fall into the ranges shown below:
Acids: 1.0 - 1.6%/℃
Bases: 1.8 - 2.2%/℃
Salts: 2.2 - 3.0%/℃
Drinking water: 2.0%/℃
Ultrapure water: 5.2%/℃

Average temperature coefficients of standard electrolyte solutions expressed as %/℃ of the conductivity value at 25℃

Temp. Range ℃	KCl 1 M	KCl 0.1 M	KCl 0.01 M	Saturated NaCl
15 - 25	1.725	1.863	1.882	1.981
15 - 25 - 35	1.730 (15 - 27°C)	1.906	1.937 (15 - 34°C)	2.041
25 - 35	1.762 (25 - 27°C)	1.978	1.997 (25 - 34°C)	2.101

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