AMPROBE®

WT-60

Conductivity / TDS
Water Quality Meter

Users Manual

- Mode d'emploi
- Bedienungshandbuch
- Manual d'Uso
- Manual de uso

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Water Quality Meter

Users Manual

English

September 2009, Rev.1

Limitation of Liability

Your Amprobe product will be free from defects in material and workmanship for 1 year from the date of purchase. This warranty does not cover fuses, disposable batteries or damage from accident, neglect, misuse, alteration, contamination, or abnormal conditions of operation or handling. Resellers are not authorized to extend any other warranty on Amprobe's behalf. To obtain service during the warranty period, return the product with proof of purchase to an authorized Amprobe Test Tools Service Center or to an Amprobe dealer or distributor. See Repair Section for details. THIS WARRANTY IS YOUR ONLY REMEDY. ALL OTHER WARRANTIES - WHETHER EXPRESS, IMPLIED OR STAUTORY - INCLUDING IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY, ARE HEREBY DISCLAIMED. MANUFACTURER SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, ARISING FROM ANY CAUSE OR THEORY. Since some states or countries do not allow the exclusion or limitation of an implied warranty or of incidental or consequential damages, this limitation of liability may not apply to you.

Repair

All test tools returned for warranty or non-warranty repair or for calibration should be accompanied by the following: your name, company's name, address, telephone number, and proof of purchase. Additionally, please include a brief description of the problem or the service requested and include the test leads with the meter. Non-warranty repair or replacement charges should be remitted in the form of a check, a money order, credit card with expiration date, or a purchase order made payable to Amprobe® Test Tools.

In-Warranty Repairs and Replacement – All Countries

Please read the warranty statement and check your battery before requesting repair. During the warranty period any defective test tool can be returned to your Amprobe® Test Tools distributor for an exchange for the same or like product. Please check the "Where to Buy" section on www.amprobe.com for a list of distributors near you. Additionally, in the United States and Canada In-Warranty repair and replacement units can also be sent to a Amprobe® Test Tools Service Center (see below for address).

Non-Warranty Repairs and Replacement – US and Canada

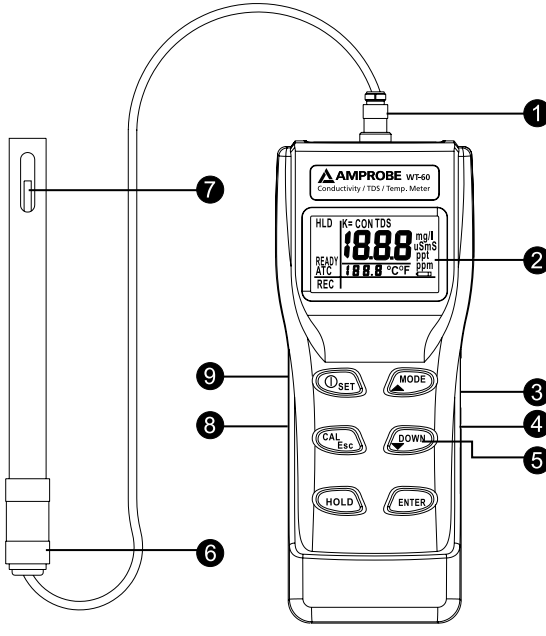
Non-warranty repairs in the United States and Canada should be sent to a Amprobe® Test Tools Service Center. Call Amprobe® Test Tools or inquire at your point of purchase for current repair and replacement rates.

In USA	In Canada
Amprobe Test Tools	Amprobe Test Tools
Everett, WA 98203	Mississauga, ON L4Z 1X9
Tel: 888-993-5853	Tel: 905-890-7600
Fax: 425-446-6390	Fax: 905-890-6866

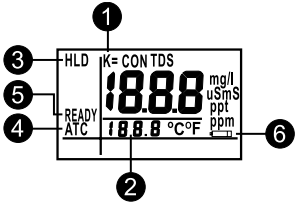
Non-Warranty Repairs and Replacement – Europe

European non-warranty units can be replaced by your Amprobe® Test Tools distributor for a nominal charge. Please check the "Where to Buy" section on www.amprobe.com for a list of distributors near you.

Amprobe® Test Tools Europe
In den Engematten 14
79286 Glottertal, Germany
tel: +49 (0) 7684 8009 - 0
*(Correspondence only – no repair or replacement available from this address. European customers please contact your distributor.)



1. **Probe socket**
2. **LCD display**
3. **Adaptor port**
4. **USB port**
5. **Operation keys**
6. **Probe**
7. **Temperature sensor**
8. **Battery cover (rear side)**
9. **Tripod mount hole (rear side)**



1. **Conductivity reading (unit: uS or mS) or TDS reading (unit: ppt or ppm or mg/l)**
2. **Display temperature in either degree Celsius or degree Fahrenheit**
3. **Freeze display**
4. **ATC to indicate auto temp. compensation**
5. **READY to indicate the reading is stable**
6. **low battery indicator**

POWR/SET KEY: Press key to turn on and off the meter. When the meter is on, hold down for > 2 seconds to enter setting (SET)mode.

CAL/ESC KEY: Press key > 2 seconds to enter calibration mode. While in calibration or setting mode, press to return to previous mode.

HOLD KEY: Press key to freeze current reading. Press again to unlock. When the meter is off, press SET+HOLD simultaneously > 1 second to disable auto-sleep mode.

MODE KEY: Press this key to switch Cond. & TDS. Press > 2 seconds to manually set range. In setting or calibration mode, press to increase value.

DOWN KEY: Press to record current reading. In setting mode, press to decrease the value.

ENTER KEY: In setting or calibration mode, press to confirm and enter next step.

CONTENTS

SYMBOL

⚠	Caution ! Refer to the explanation in this Manual
✓	Conforms to relevant Australian standards
CE	Complies with European Directives
	Do not dispose of this product as unsorted municipal waste.

⚠Warning and precaution

- Do not make the air bubble adhere on the electrode. That may cause inaccurate reading.
- Do not operate the meter in flammable liquid.

UNPACKING AND INSPECTION

Your Shipping carton should include:

1 WT-60 Conductivity / TDS Water Quality Meter

1 Probe

4 AAA batteries

1 User's Manual

If any of the items are damaged or missing, return the complete packag to the place of purchase for an exchange.

INTRODUCTION

Congratulations on your purchase of WT-60 Conductivity/TDS water quality meter. Conductivity measurements are used extensively in many industries. For example, conductivity measurements are used to monitor quality in public water supplies, in hospitals, in boiler water and industries which depend on water quality such as brewing. WT-60 is a convenient instrument to measure water conductivity, TDS and temperature.

Features

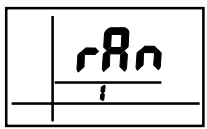
- Dual display with ATC (°C / °F switchable)
- Data hold to freeze display
- Selectable conductivity to TDS conversion factor
- USB download capabilities
- Low battery indicator.
- Auto power off
- Maximum 5 calibration points

OPERATION

Conductivity Measurement

1. Select range:
   Meter is defaulted at "auto-ranging" which determines and selects the range and gives the greatest resolution and accuracy. Alternatively, you can manually select by pressing **MODE** >2 seconds. 5 ranges for selection and "rAn" (auto ranging). It cycles from 1 to 5 and get back to auto. (Fig. 1)

Fig. 1



2. Automatic Temperature Compensation:
   The meter is defaulted as ATC on. To disable ATC, refer to programming setting P1.3 and P3.3 for manual temp. compensation.
3. ASetting correct temperature coefficient:
   Factory default is 2.1% per C (temperature coefficient) and this provides good results for most applications. Refer P3.1 if a different value is needed.
4. Select normalization temperature:
   Factory default is 25 °C. Refer P3.2 if a different value is needed.

5. Rinse the probe with deionized or distilled water to remove any impurity adhering to electrode body. If the electrode isn't used for a long time, please soak probe for more than 8 hours to clear up the lazy effect of the probe.
6. Dip the probe into the sample. Make sure no air bubbles are tapped on the slot of the probe. To remove air bubbles, stir the probe mildly and make sure the electrode tip is submerged.
7. Stir the probe gently to create a homogenous sample.
8. Take readings. When the reading is stable, "**READY**" will display on the left-middle LCD.

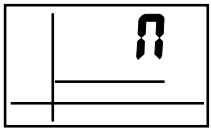
TDS Measurement

1. Set a correct TDS conversion factor. Factory default is 0.50. Refer P1.1 if a different value is needed. See Appendix A & B for more information.
2. Select range & ATC/manual TC per your application.
3. Take readings. Press "**MODE**" to switch to TDS mode and get the reading.

Auto power off

This meter will shut off automatically 20 minutes of inactivity. To disable the auto power off, pressing "**SET**" + "**HOLD**" keys simultaneously while turning on the meter until a "**n**" appeared on the screen and then release keys to return to normal mode. (Fig.2)

Fig. 2



Setup

The advanced setup mode lets you customize your meter.
4 types parameter are available.

P1.0: Meter configuration: (CoF)
P1.1:TDS factor(tdS)
P1.2: READY indicator:(rdy)
P1.3: ATC or Manual TC: (Atc)

P2.0: Unit :(Unt)
P2.1 select OC or OF:(t)
P2.2 select ppm or mg/L: (tdS)

P3.0: temperature parameters: (t)
P3.1: Temperature coefficient:(tCo)
P3.2: Normalization temperature:(nor)

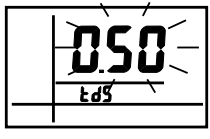
P4.0: View calibration data (CAL)

P5.0: Electrode data:(ELE)

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

P1.0: Meter configuration: (CoF)
P1.1: TDS factor (tdS):
The dissolved salts increases conductivity but the effect varies from sal to salt and is roughly linear in a given range for a given salt. The TDS conversion factor is used to convert conductivity into TDS.
In P1.0, press **ENTER** to enter P1.1. Press again to see TDS factor flashes on LCD (Fig.3). Press **UP/DOWN** to change the value from 0.40 to 1.00. The default value is 0.50. Press **ENTER** to confirm and enter P1.2.

Fig. 3



P1.2: READY indicator: (rdy)

Meter is defaulted as "**ON**". Icon displays when measurement gets stable. Users can turn it off for faster response. Press **UP /DOWN** to switch "**on**" and "**off**". Press **ENTER** to confirm and enter P1.3.

P1.3: ATC or Manual TC: (Atc)

Meter is defaulted as ATC on. Press **UP/DOWN** to switch on and off. Press **ENTER** to confirm and return to P1.0.

P2.0: Unit : (Unt)

P2.1: Select °C or °F:(t)

Select P2.0 and press **ENTER** to P2.1. Default unit oC is blinking on LCD. Press **UP/DOWN** to switch oC and oF. Press **ENTER** to confirm and enter P2.2.

P2.2: Select ppm or mg/L: (tdS)

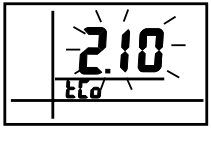
The default TDS unit "**ppm**" blinks on LCD. Press **UP/ DOWN** to switch between ppm and mg/l, Press **ENTER** to confirm and return to P2.0.

P3.0: temperature parameters: (t)

P3.1: Temperature coefficient: (tCo)

The temp. coefficient (expressed in percent per °C) is the changed ratio of conductivity per degree of temp..The adjustable range is 0.0 per °C to 10.00 % per °C. The default is 2.10% per °C. 0.0% has no effect on temp. So the displayed value is the same as actual temperature. Select P3.0 and press **ENTER** to enter P3.1.Press **ENTER** again and Temperature Coefficient flashes on LCD (Fig.4). Press **UP/DOWN** to change the value from 0.0 to 10.0. Press **ENTER** to confirm and enter P3.2.

Fig. 4



P3.2: Normalization temperature: (nor)

The meter will normalize its cond. measurement to a standard temp. which you preset. The adjustable range is 15 to 30 °C (59 to 86 °F). Meter default is 25 °C (77°F). When in P3.2, press **ENTER** again and the default normalization temperature flashes on LCD. Press **UP/DOWN** to change the value from 15.0 to 30.0 °C. Press **ENTER** to confirm and enter P3.3. For more information of temperature effect on measurement, refer to Appendix C.

P3.3: Manual temp. Compensation: (Int)

When ATC is disabled, you can manually enter the temp.value of solution. Any temperature between 0 and 50 °C (32 to 122 °F) is selectable. Meter default is 25 °C (77°F).
When in P3.3, press **ENTER** again and the default manual temperature 25.0°C blinks on LCD. Press **UP/DOWN** to change the value. Press **ENTER** to confirm and return to P3.0.

P4.0: V iew calibration data (CAL)

Recall previous calibration data and help to know when is needed to re-calibrate. It's for "Review" purpose only In P4.0, press **ENTER** repeatedly to view P4.1to P4.5, and it returns P4.0 after 4.5 P4.1 is calibration data for range 1, P4.2 is for range 2, ...P4.5 is for range 5. If no previous calibration data at particular range, the display will show " - - -".

P5.0: Electrode data: (ELE)

To check the probe cell constant value for diagnostic purposes. The cell constant is adjusted according to your calibration. In P5.0, press **ENTER** repeatedly to view P5.1 to P5.5 , and it returns to P5.0 after P5.5. P5.1 is the cell constant value for range 1. P5.2 is for range 2, ... P5.5 is for range 5.

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

P7.1: Meter reset (rSt)

Reset all parameters to factory default. This function will clear all calibration data and all setup value you've done. In P7.0, press **ENTER** to enter P7.1. Press **UP/DOWN** to select "n"-NO or "y"-YES. Press **ENTER** to confirm and return to P7.0. To completely recalibrate a meter or using a replacement probe, it is suggested to clear all calibration data in memory.

Calibration Mode

Selecting a calibration standard

For best results, select a conductivity or TDS 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.

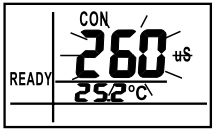
When to do the calibration?

Calibration is necessary and should be done regularly. If measure the mid-ranges, calibrate the meter at least once a month. Soak the probe for 15 mins before calibration or measurement can saturate the probe surface and minimize drift. If measure the extreme temperatures or special concentration (<100uS or >2mS), calibrate the meter at least once a week to get specified accuracy.

Conductivity calibration

1. Dip the probe into demineralized or distilled water for about 30 minutes to rinse the probe.
2. Select the conductivity standard for calibration.
3. Pour enough solution into two separate clean containers.
4. Power on the meter. Select the mode as conductivity measurement mode.
5. Rinse the probe into one of above containers. Gently stir the probe.
6. Dip the rinsed probe into the second container. Tap probe on the bottom of container to remove air bubbles. Wait about 15 mins to make the probe stabilize to the solution temperature.
7. Press **CAL** > 2 seconds to begin calibration. The conductivity value of solution will blink on LCD (Fig.5).

Fig. 5



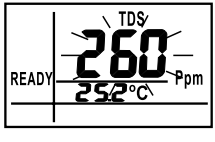
8. Press **UP/DOWN** to change the value in order to match the value to the standard solution (solution must be referred to normalization temp. 20°C if P3.2 has re-adjusted as 20°C). You can adjust the conductivity reading for +20%. However, if the measured value and standard value differs by more than 20%, it is suggested to clean probe or replace meter.
9. When calibration is stable, **"READY"** will display on LCD, press **SET** to confirm and return to conductivity measurement mode. If "READY" doesn't show, check if the calibration solution is stable enough and whether the step 8 input value is correct or not.
10. Repeat 1~9 for other ranges if needed.
11. To exit conductivity calibration mode without confirming, press " **ESC** " in step 9.

TDS calibration

Option1: Using TDS standards

1. Dip the probe into demineralized or distilled water for about 30 minutes to rinse the probe.
2. Select the TDS standard for calibration. The factory default setting of the TDS conversion factor is 0.50. You can improve the calibration accuracy by setting the TDS factor before starting the calibration. Please refer Appendix A for more information of TDS conversion factor.
3. Pour enough solution into two separate & clean containers.
4. Turn on the meter. Press **"MODE"** to select TDS mode.
5. Rinse the probe into one of the containers. Gently stir the probe.
6. Dip the rinsed probe into the second container. Tap the probe on the bottom of container to remove air bubbles. Let the probe stabilize to the solution temperature.
7. Press **CAL** >2 seconds to begin the calibration. The TDS value will blink on the LCD (Fig.6).

Fig. 6



8. Press the **UP/DOWN** to adjust the value to match the value to the standard solution.
9. When calibration is stable, **"READY"** will display on LCD, press **SET** to confirm and return 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 setting P1.1.

SPECIFICATION

Range
Cond. (uS/cm): 0~19.99, 0~199.9, 0~1999
(mS/cm): 0~19.99, 0~199.9
TDS (ppm): 0~19.99, 0~199.9, 0~1999
(ppt): 0~19.99, 0~199.9
Resolution: 0.05% Full Scale
Accuracy: 1% Full Scale±1digit
TDS factor: 0.40~1.00
Calibration Standard: (0.3~1) * Full Scale

Range
ATC: 0~80°C / 32~176°F
Temperature Range: 0~93°C / 32~199°F
Temperature Res.: 0.1°C/°F
Temperature Accuracy: ±0.6°C(<50°C), +1°C (>50°C)
Temp. Coefficient: 0.0~10.0% per degree C
Normalization Tempe.: 15.0~30.0°C
Cell Constant: 1.0
Operation temp.: 0~50°C / 32~122°F
Power Requirements: 4pcs1.5V (Type: AAA)

CE EMC: Conforms to EN61326-1. This product complies with requirements of the following European Community Directives: 89/ 336/ EEC (Electromagnetic Compatibility) and 73/ 23/EEC (Low Voltage) as amended by 93/ 68/ EEC (CE Marking). However, electricalnoise or intense electromagnetic fields in the vicinity of the equipment maydisturb the measurement circuit. Measuring instruments will also respond tounwanted signals that may be present within the measurement circuit. Usersshould exercise care and take appropriate precautions to avoid misleading results when making measurements in the presence of electronic interference.

MAINTENANCE AND REPAIR

If there appears to be a malfunction during the operation of the meter, the following steps should be performed in order to isolate the cause of the problem.

1. Check the battery. Replace the battery immediately when the symbol "  " appears on the LCD.
2. Review the operating instructions for possible mistakes in operating procedure.

Except for the replacement of the battery, repair of the meter should be performed only by a Factory Authorized Service Center or by other qualified instrument service personnel. The front panel and case can be cleaned with a mild solution of detergent and water. Apply sparingly with a soft cloth and allow to dry completely before using. Do not use aromatic hydrocarbons, Gasoline or chlorinated solvents for cleaning.

Make sure the electrode is clean! Between measurements,rinse the electrode with deionised water. If the electrode has been exposed to a solvent immiscible with water, clean it with a solvent miscible with water e.g. ethanol or acetone and rinse carefully with water.Store the electrode carefully! Before storing, rinse it carefully in deionized water and store DRY.

Battery Replacement

1. Turn off the meter and open the battery cover.

2. Replace the old batteries with four new AAA batteries.

USB PC INTERFACE CAPABILITIES

The USB cable and software are required to transfer data to a pc. The USB port is located on the right side of the instrument. The USB cable is not included. it can be purchased separately as an optional accessory. The protocol is:
Format: C***. **uS(mS):t***.*C(F):D***. **ppm(ppt)LRCCRLF
Baud rate: 9600 bit/sec
Data bit: 8
Stop bit: 1
Parity: none

TROUBLESHOOTING

Power on but no display

- Make sure you press power key more than > 0.3 Second.
- Check the battery conditions and replace if necessary.
- Move batteries away for one minute and then re-install.

Display disappear

- Check whether the low battery icon is appeared before the display is off. If yes, replace with new batteries.

Air bubbles adhere on electrode

- Stir the electrode completely and better to dip the electrode into solution at oblique angle. After soaking the electrode for 15~30 minutes, inspect the electrode carefully to make sure no bubbles adhere.
- If air bubbles still exist, tap the bottom of the container gently and stir the electrode to remove the air bubbles. If above method are not working, remove the electrode out of solution and blow at the electrode to remove the air bubbles.

Error code

Parameter: Conductivity

"E01", Probe is disconnected or damaged.

• Check the probe socket. If E01 still appears, replace probe.

"E02", Conductivity value is over the range limit or meter is damaged.

• Put the meter in standard solution. If E02 still appears, send back for repair.

"E03", Conductivity value is over the range limit or meter is damaged.

• Put the meter in standard solution. If E03 still appears, send back for repair.

"E04", Caused by temp. reading error.

• Refer to error code of temp. After solving the error of temp, E04 will disappear.

"E32", Caused by IC memory error.

• send back for repair.

"E41", Caused by meter configuration error.

• Re-program the meter with correct setting.

Parameter: TDS

"E04", Caused by temp. or conductivity error.

• Refer to error code of temp. & conductivity. After solving the error of temp. & conductivity, E04 will disappear.

Parameter: TDS

"E01", Temperature circuit is damaged.

• send back for repair.

"E02", Temp value is lower than range limit or temp. circuit is damaged.

• Put the meter in room temp. for 5 mins. If E02 still appears, send back for repair.

"E03", Temp value is higher than range limit or temperature circuit is damaged.

• Put the meter in room temp. for 5 mins. If E03 still appears, send back for repair.

APPENDIX A: CONDUCTIVITY TO TDS CONVERSION FACTORS

Conductivity at 25 °C	TDS KCL		TDS (NaCL)		TDS (442)	
	ppm	Factor	ppm	Factor	ppm	Factor
23µS	11.6	0.5043	10.7	0.4652	14.74	0.6409
84µS	40.38	0.4807	38.04	0.4529	50.5	0.6012
447µS	225.6	0.5047	215.5	0.4822	300	0.6712
1413µS	744.7	0.527	702.1	0.4969	1000	0.7078
1500µS	757.1	0.5047	737.1	0.4914	1050	0.7
2070µS	1045	0.5048	1041	0.5029	1500	0.7246
2764µS	1382	0.5	1414.8	0.5119	2062.7	0.7463
8974µS	5101	0.5685	4487	0.5	7608	0.8478
12,880µS	7447	0.5782	7230	0.5613	11,367	0.8825
15,000µS	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 B: CALCULATING TDS CONVERSION FACTORS

The meter can be calibrated using TDS calibration standard solutions. The calibration standard only needs to give the TDS value at a standard temperature such as 25°C. To determine the Conductivity-to-TDS conversion factor use the following formula:

Factor = Actual TDS ÷ Actual Conductivity @ 25°C

Definitions:
Actual TDS: Value from the solution bottle label or as a standard you make using high purity water and precisely weighed salts.

Actual Conductivity: Value measured using a properly calibration 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 in is ppm, the conductivity value must be in µS; 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 C: TEMPERATURE EFFECT

Conductivity measurements are temperature dependent, if the temperature increases, conductivity increases. For example the conductivity measured in a 0.01M 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 conductivity and temperature and then converts it to the reference temperature using a temperature correction function and displays the conductivity at the reference temperature.

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 WT-20 use 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 solutions, acids and leaching solutions.

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

where:

K_{Tref} = 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°C different from T1. The temperature coefficients of the following electrolytes generally fall into the ranges shown below:

Acids: 1.0 - 1.6%/°C

Bases: 1.8 - 2.2%/°C

Salts: 2.2 - 3.0%/°C

Drinking water: 2.0%/°C

Ultrapure water: 5.2%/°C

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

Temp. range°C / °F	**KCl 1 M**	**KCl 0.1 M**	**KCl 0.01 M**	**Saturated NaCl**
15 – 25 **°C** 59 – 77**°F**	1.725	1.863	1.882	1.981
15 – 25 – 35 **°C** 59 – 77 – 95 **°F**	1.730 (15–27°C)	1.906	1.937 (15–34°C)	2.041
25 – 35 **°C** 77 – 95 **°F**	1.762 (15–27°C)	1.978	1.997 (25–34°C)	2.101

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