HANNA Knowledge Base

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General pH Information

What is pH?

A pH (potential of Hydrogen) measurement reveals if a solution is acidic or alkaline (also base or basic). If the solution has an equal amount of acidic and alkaline molecules, the pH is considered neutral. Very soft water is commonly acidic, while very hard water is commonly alkaline, though unusual circumstances can result in exceptions. The pH scale is logarithmic and runs from 0.0 to 14.0 with 7.0 being neutral. Readings less than 7.0 indicate acidic solutions, while higher readings indicate alkaline or base solutions. Some extreme substances can score lower than 0 or greater than 14, but most fall within the scale. Back To Top ^

What is automatic temperature compensation (ATC)?

When measuring pH using a pH electrode the temperature error from the electrode varies based on the Nernst Equation as 0.03pH/10C/unit of pH away from pH7. The error due to temperature is a function of both

temperature and the pH being measured. Temperature compensation can be achieved manually or automatically. Manual temperature compensation is usually achieved by entering the temperature of the fluid being measured into the instruments menu and then the instrument will display a "Temperature Compensated" pH reading. Automatic temperature compensation requires input from a temperature sensor and constantly sends a compensated pH signal to the display. Automatic temperature compensation is useful for measuring pH in systems with wide variations in temperature. Back To Top ^

EC/TDS

What is EC?

Electrical Conductivity (EC) is defined by the ability of a solution to conduct an electrical current. Back To Top ^

What is TDS?
Total Dissolved Solids (TDS) is defined as the amount of solids dissolved in a solution. Back To Top ^

What is their relationship?
The relationship between the amounts of solids such as salts found in fertilizers is directly proportional to their conductivity, therefore, the higher the amount of solids the greater the conductivity. This is because when fertilizers are dissolved into water they become "ions", which means that they become positively or negatively charged and can therefore conduct a current. Back To Top ^

How does an EC/TDS meter work?
Two electrodes with an applied AC voltage are placed in the solution. This creates a current dependent upon the conductive nature of the solution. The meter reads this current and displays in either conductivity (EC) or ppm (TDS). Back To Top ^

Conversion Factors
TDS meters read the conductivity; the meter automatically converts this value to TDS which is typically displayed in ppm. Back To Top ^

Temperature Compensation
Temperature affects the activity of the ions in solution but does not affect the concentration, therefore meters with temperature compensation correct for this condition. Back To Top ^

How is TDS measured?
By means of a conductivity meter. The conductivity is measured and the TDS is calculated by a fixed mathematical formula in the meter. Back To Top ^

What about conversion factors?
Research has shown that a conversion factor between .64 and .70 to be the best indication of Total Dissolved Solids in growing applications. Back To Top ^

If I have a TDS meter with a 0.5 conversion factor how do I convert to the correct 0.7 value?
Multiply by 1.4; ex: 500 x 1.4 = 700. Back To Top ^

What is the difference between microSiemens (µS) and milliSiemens (mS)?
Both are units of conductivity. 1000 microSiemens (µS) = 1 milliSiemen (mS).
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How do I convert between milliSiemens (mS) and ppm?
Convert to microSiemens by multiplying by 1000. Then multiply by 0.7: ex. Your reading is 2.14 milliSiemens (x 1000 = 2140 microSiemens). 2140 x 0.7 = 1498 ppm. Or simply multiply by 700. (2.14 x 700 = 1498) Back To Top ^

What if I want to switch to EC measurements?
If you do not have a meter which reads both in EC and TDS you may prepare your fertilizer solution according too the directions given and take the EC reading. This will be your value. Or, consult with the manufacturer of your fertilizer for the correct EC readings for that particular fertilizer. Back To Top ^

What is the relation between electrical conductivity (EC) & dissolved solids (TDS)?
Though there is a close relationship between TDS and Electrical Conductivity, they are not the same thing. Total Dissolved Solids (TDS) and Electrical Conductivity (EC) are two separate parameters. TDS is the combined total of

solids dissolved in water. EC is the ability of something to conduct electricity (in this case, water's ability to conduct electricity).

The only true method of measuring TDS is to weigh residue found in water after the water has evaporated. You know those spots you see on a glass after you wash it and let it air dry? That's TDS! That residue has mass, and it's possible to weigh it, but if you're not in a lab, it can be tricky thing to do. Therefore, we can estimate TDS levels based on the conductivity of the water since the hydrogen and oxygen molecules of the H2O carry almost no electrical charge. The EC of most other metals, minerals and salts will carry a charge. A A TDS meter measures that EC level and then converts it to a TDS measurement. Since different metals, minerals and salts will be more or less conductive than others, there are different conversion factors that can be used.

ppm (parts per million) is the most commonly used scale to measure TDS (Total Dissolved Solids).

µS (micro-Siemens) is the most commonly used scale to measure EC (Electrical Conductivity). Back To Top ^

Turbidity

What is turbidity and why is it measured?

Turbidity is a measure of the cloudiness of water- the cloudier the water, the greater the turbidity. Turbidity is caused by suspended solids caused by phytoplankton, human activities that disturb land such as construction that can result in high sediment levels.

Turbidity is important because high turbidity in drinking water can lead to develop into gastrointestinal diseases. High turbidity in water bodies such as lakes, rivers and reservoirs, can reduce the amount of light reaching lower depths, which can inhibit growth of submerged aquatic plants and consequently affect species which are dependent on them, such as fish and shellfish.

Turbidity in wine can impact aroma and quality. Turbidity can also cause membrane fouling during microfiltration. Back To Top ^

Selective Ions

Nitrogen

Nitrogen is an indispensable element for plant life and a key ingredient in fertilizers. It is present in proteins, vitamins, hormones, chlorophyll, ect. Nitrogen increases the production of foliage and fruits. An excess of Nitrogen can lead to a decreased resistance to disease. Back To Top ^

Phosphorus

Phosphorus contributes to the formation of buds, roots, blooming and lignifications. It is also an important component of plant's DNA and RNA. A lack of phosphorus results in slow growth, smaller fruits and a lower expansion of the roots. Back To Top ^

Potassium

Potassium plays an important role in many physiological activities such as the formation of carbohydrates and increases the size of fruits, enhances flavor, has a positive effect on the color and fragrance of flowers. Potassium also makes plants more resistant to diseases. Back To Top ^

Dissolved Oxygen

Roots must be properly oxygenated in order to avoid serious problems including water stress which leads to wilting, blossom-end rot and root rot itself. Main causes of oxygen depletion include the formation of a large root mass developing which will impede the flow of water and result in water stagnation. Testing of Dissolved Oxygen is recommended because the problem can start to occur unnoticed and have seriously detrimental consequences on the plant. Back To Top ^

Electrodes

Does my pH electrode have to be wet?

All glass electrodes have a bulb which must be kept hydrated and a reference junction which must be kept wet to prevent excess leakage of the internal electrolyte solution from the reference junction. Back To Top ^

What should I store my pH electrode in?

Ideally, storage solution since it has the same chemical make-up of what is in the electrode itself, but if that is not available use buffer 4 or 7 solution. NEVER STORE IN PURE (DISTILLED) WATER!!! In the case of electrodes that are continuously immersed, storage is not an issue since they are constantly wet. Back To Top ^

What if I see white crystals on my pH electrode?
It is simply electrolyte (salt) and by soaking the electrode for a couple of hours the electrode will be fine unless it has been dry for long periods of time. Back To Top ^

How do I clean my pH electrode?
Apart from rinsing the end of the electrode in water, the best way of making sure the electrode is properly clean is to use one of our special cleaning solutions. We have cleaning solutions for specific applications, for example our protein cleaning solution is ideal for anyone taking pH measurements of food products, while our oil cleaning solution will remove oil and grease deposits from the measurement bulb of the electrode which would slow response time down:
HI 7061 General purpose cleaning solution.
HI 7073 Protein cleaning solution
HI 7074 Inorganic substances
HI 7077 Oil and fat cleaning solution Back To Top ^

How should I maintain my pH electrodes?
Periodically clean your electrode with mild acid or professionally formulated cleaning solutions and, of course always properly store your electrodes. Back To Top ^

How long will a pH electrode last?
Electrodes can last up to 2 years if properly maintained. Back To Top ^

Does my EC/TDS electrode have to be wet?
No. Back To Top ^

Why do pH electrodes have different tip shapes?
pH is a critical parameter for an incredible number of applications going from general water to food, soil, fruits & vegetables, blood, synthetic products and many others. For that, manufacturers have developed different pH sensors for all major applications. This ensures ease of use and longer life of the electrode in a specific application. Different types of junctions, electrolytes and materials used in electrode construction are also part of the design. Below are typical tips and their intend :

Sphere tip: it is the most common tip found in the market as it is mainly used in laboratories on general liquids.
Cone tip: its shape allows easy penetration into semi solids, emulsion solutions, cheese and meat. Mainly used in the food industry.
Flat tip: its construction in intended for surface measurement such as fruits & vegetables skin, drops of samples, human skin, etc.
Knife tip: the knife probe allows for penetration into semi-frozen food, meat, hard to penetrate food products or others. Many other types of tips are available. The above are the most common. Back To Top ^

What is the "Replenishable junction" you have invented?
Over time, the junction which is the most sensitive part of the pH electrode can become clogged. This results in the electrode response becoming increasingly sluggish and eventually impossible to calibrate. With the new Hanna replenishable junctions, by using an ordinary pair of tweezers, simply pull out 1-2mm (1/8") of the fiber junction and you will literally have a reconditioned pH electrode. This procedure can be repeated up to 15 times, before the whole fiber gets out. Back To Top ^

What is the difference between single and double junction?
Conventional electrodes are normally single junction. These electrodes have only a single junction which serves to put the reference electrode system in contact with the sample. Under adverse conditions e.g., high pressure, high temperature, highly acidic or alkaline solutions etc., the positive flow of the electrolyte through the junction is often reversed resulting in the ingress of sample solution into the reference compartment. If this is left unchecked, the reference electrode ultimately is contaminated, leading to complete electrode failure. Hanna's double junction system, as the name implies, has two junctions, only one of which is in contact with the sample. Under adverse conditions, the same tendency of sample ingress is evident. However, as the reference electrode system is separated physically from the intermediate electrolyte area, the contamination of the electrode is minimized. This leads to long electrode life. The chances of recovery are also higher if proper maintenance procedures are taken.
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My Dissolved Oxygen electrode is dry. What should I do?
Remove the red and black plastic cap or the membrane assembly. Soak the bottom 1 inch in electrolyte solution for 5 minutes. Rinse the membrane with electrolyte and refill with clean electrolyte. Gently tap the sides of the

membrane cap to ensure that no air bubbles remain trapped. Adjust O-ring inside membrane cap. With the sensor facing down screw the membrane assembly. Back To Top ^

Can I use Distilled or Deionized water to store my pH electrode?
No, never use this for storage it will damage the electrode. Back To Top ^

Sensors / Probes

What ORP sensor should I use platinum or gold?

Platinum sensor: use in oxidizing reaction (above 500mV) such as pools & spas, municipal drinking water. Gold sensor: use in reducing environment (below 500mV) such as galvanic applications, mining industry (Cyanide). Back To Top ^

My readings are not stable. What should I do?
The probe is under polarization with a fixed voltage of approximately 800mV. Probe polarization is essential for stable measurements with the same recurring degree of accuracy. With the probe properly polarized, oxygen is continually "consumed" by passing through the sensitive diaphragm and dissolving in the electrolyte solution contained inside the probe. Back To Top ^

Testers

Are 1.5V batteries OK for HANNA testers?

Yes, they will work the same as 1.4V. Back To Top ^

What kind of batteries can I use in my pocket tester?
You can use a 357 or LR44 type battery. Back To Top ^

Calibration

How often should I calibrate my pH meter?

It can vary. However, by performing periodic checks with fresh calibration solution you can determine when and how often calibration is necessary. Back To Top ^

How often should I calibrate my EC/TDS meter?
Typically not as often as a pH meter since there is no junction open to the outside. It is best to perform periodic checks with fresh calibration solution to determine when calibration is necessary. Back To Top ^

How do I calibrate my pH meter?
Most of the Hanna pH meters work in the same way but you should always check what your manual says. A general overview of the calibration procedure is present here. Place the instrument into calibration mode either by pressing the CAL button or pressing and holding down the ON/OFF button until CAL appears on the screen.

At this point most meters will request the use of Buffer 7.01, and all meters will need to be calibrated to pH 7 buffer first.

Place the electrode in to the buffer 7 solution so that the bottom inch of the electrode is submersed. Hanna meters are programmed to automatically recognise a selection of Buffers (please check the product specific specifications to find out which solutions). While the meter is waiting for the reading to stabilise a clock symbol or hour glass symbol will flash (on some of the hand held meters the reading will flash). If the meter is unable to recognise the Buffer the message WRONG will appear on the screen.

Once the meter has reached a stable reading it will automatically calibrate itself. The meter will then request the use of the next buffer solution, the screen will now show 'USE 4.01'.

At this point remove the electrode from the Buffer 7 solution and rinse it under tap water (or deionized water) and then place the electrode into the Buffer 4 solution.

Once again the meter will show that the reading is stabilizing by either flashing or showing an hour glass/ clock symbol. Back To Top ^

Do I need to Calibrate an ORP electrode?
No. ORP electrodes do not need calibration with the meter such as pH. Still, ORP electrodes need to be conditioned prior to use. When the electrode is new, soak the tip in warm tap water. This will enhance the flow of the reference junction. To check function of the electrode, immerse the tip in ORP solution HI 7021L or HI 7022L. The reading should be +/- 50mV from the value indicated on the bottle. If the reading is not within the +/-50mV,

oxidizing or reduction treatment with HI 7092 or HI 7091 is required. It will also prepare the electrode's surface and speed initial response time. Since in-line process electrodes are already in a solution, a simple test with either HI 7021L or HI 7022L will show you the electrode's condition. Should your probe not be accurate enough after conditioning & testing, follow the cleaning procedure.
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Does my new pH, Conductivity or DO meter come calibrated?
Yes, but HANNA recommends you calibrate your meter before using it.
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Solutions

Which buffer solutions should I use to calibrate my pH meter with?

As you will see on our website, we manufacture a wide range of buffer solutions for a variety of applications. However, for 99% of the time buffer 7 and buffer 4 solution are the two you need to perform a calibration. If you are measuring mostly in the alkaline scale, then you might use buffer 7 and buffer 10, although buffer 10 is not as stable a solution as buffer 4, and therefore has a much shorter life once exposed to air.
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I do not have the HI70300 storage solution. What else could I use?
You can use your pH 4 buffer. Just place a few drops of that inside the cap to keep the electrode moist. Back To Top ^

I received my solution and it was frozen. Can I use it?
Yes, just make sure you let it defrost in a sink incase the bottle cracked when it froze. Back To Top ^

Software

Why isn't my HI-92000 software working?

The current version of this software is Version 5.0. At this time the software is only compatible with PCs using Windows XP and older and is not Mac compatible. If you have an older version of the HI-92000 software then it may not be compatible with more recent Windows editions. Back To Top ^

Is the data download function on the benchtop meters compatible with other operating systems than just Windows?
No. It is only Windows compatible. Back To Top ^

Meters

Why do I get "Err 1" reading on my turbidity meter?

"Err 1" is an error code that signifies that the light flow is reduced. The cuvet should be cleaned with the solution and the tissue designed for this use. If this procedure has not removed your error code, the light source will need cleaning. This should be performed yearly, more frequently if required. The light source inside the cavity should be cleaned with the aid of a cotton swab dipped in alcohol. Back To Top ^

What should I do if my readings are unstable on my photometer?
The zeroing and the measurements should be done using the same cuvet. Interferences are possibly due to condensation or particles on the cuvet wall. Clean the outside of the cuvet with solution and tissue designed for this use. Back To Top ^

My HI937xx series meter display a "LO" message when zeroing the meter?
Contact Technical Support, they can provide you with an adjustment procedure.
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How do I change my meter with MODE and SET/HOLD buttons from °C to °F?
Turn the meter on by pressing the MODE button one time. Once it is powered up. Press and Hold down the MODE button. You will see OFF CAL TEMP Let the button go when you see TEMP Now press the Set/Hold button to change °C to °F. Then press the MODE button twice to return to the measuring mode. Back To Top ^

Can the HI991404 series of grocheck meters be used with digital ballasts?
The HI991404 and HI991405 do not work correctly when you have the digital ballasts. The meters pick up electrical interference or noise from the ballasts. We have tried installing a capacitor which made them work with the traditional ballasts but this does not work. If you have the digital ballasts you need to use the HI981504 model. Back To Top ^

Agriculture

How do I measure pH & EC in soil with extraction method?

Extraction method to measure pH & EC is as follow. 1- Mix 3 oz. of soil with 6 oz. of water 2- Let mixture stand 15-20 minutes 3- Filter liquid into clean cup 4- Measure Simplify these pH & EC measurement by measuring directly into soil with HI 99121 pH meter & HI 993310 EC meter. Back To Top ^