The Health Metric Guide to Total Dissolved Solids (TDS) Testing

Index

What is TDS?

TDS stands for Total Dissolved Solids. It is a measure of all the dissolved substances in a water sample. These “dissolved solids” are mostly inorganic salts like sodium, calcium, magnesium and potassium cations along with chloride, bicarbonate, carbonate, phosphate, sulfate and nitrate anions. TDS also includes dissolved organics compounds too. True TDS measurements must be performed in an analytical laboratory. The water sample is weighed then heated under tightly controlled conditions to evaporate the water. The remaining weight of the leftover “solids” are used to calculate the total dissolved solids in the water sample. The unit of measure is parts per million (ppm), which is the same as milligrams per liter (mg/l). For most testing applications , this level of accuracy is not necessary. It is expensive and must be performed in a qualified laboratory. A much faster method is to use a TDS meter.

How TDS meters work

TDS meters don’t directly measure total dissolved solids. Remember, TDS is determined by evaporating the water and weighting the remaining solids. Hand-held TDS meters measure EC (electrical conductivity). Dissolved salts, minerals, nitrate, and metals conduct electricity and other inorganic ions conduct electricity. The higher the concentration of these substances in the water sample, the higher the electrical conductivity. The meter converts the EC reading into TDS as parts per million (ppm). Dissolved organic compounds don’t conduct electricity and aren’t detected by the meter. However, TDS meters do not detect organic substances like pesticides, gasoline and solvents. For most water testing TDS meters are easy to use and provide relatively accurate TDS readings. The Health Metric TDS meter provides the EC level in microsiemens (µS) and TDS in ppm. The Health metric TDS meter is factory calibrated using the NaCl conversion factor. No user calibration is necessary.

Why is TDS important?

TDS is not a measure of harmful substances or pollutants. TDS is simply a measure of all substances dissolved in water. Distilled water has a TDS of 0.0 ppm. The ocean has a TDS of 10,000 ppm. Both water sources are safe. Good or bad TDS is relative to the water being tested and what the water is used for. TDS is a good tool for monitoring the general water quality of a known source of water. Here is a perfect example! If you tested the TDS of distilled water and found it was 300 ppm, you would know the water was not distilled. Perhaps the water purification system was faulty or something had contaminated the distilled water. TDS testing is like a "watch dog." It will tell you if things are not as they should be. Let's take a look at all the ways you can use a TDS meter to check on water quality.

TDS and tap water

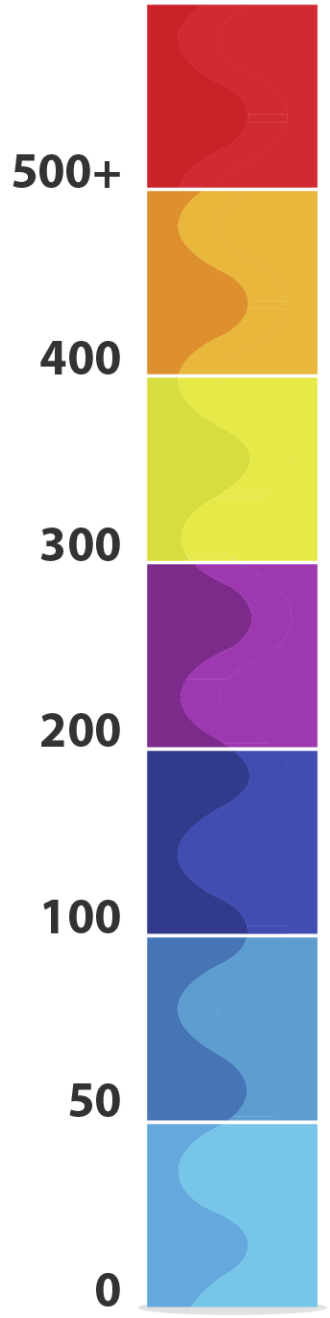
Tap water contains a variety of minerals and salts like calcium, magnesium, chloride and potassium. The more minerals and salts in the water, the higher the TDS. The United States Environmental Protection Agency sets the standards for drinking water in the US. The maximum TDS in drinking water is 500 ppm. A high TDS usually indicates the water source contains a high level of calcium and magnesium (hard water) and other salts. This water is probably corrosive to plumbing fixtures, pipes and appliances. The water may taste bad too, due to the high mineral content. High TDS does not mean the water is toxic or harmful.

What TDS level is normal ?

"Normal" TDS levels are relative to the type of water being tested. Reverse osmosis water should have low TDS. Mineral spring water normally has a higher TDS level. We've created the following TDS reference chart to help explain this concept.

Total dissolved solids(tds)
in parts per million(ppm)

HEALTH METRIC
Making the complex simple



EPA upper limit for
aesthetics and corrosion

Specialty mineral /alkaline
drinking water - Salty well water, mineral spotting

Softened water

Hard Water
(TDS 170)

Water naturally low
in salts and minerals

Reverse osmosis
and distilled water

Average
tap water

TDS and water filters

Most water filtration systems have no effect on TDS. That's because they remove organic compounds that cause taste and odor problems but aren't detected by TDS meters. While heavy metals are a health concern and contribute to TDS, their levels are so low that they hardly impact the TDS level. Water softeners use the ion-exchange process. The resin beads in the water softener trades (exchanges) sodium ions for calcium and magnesium ions (water hardness). Calcium and magnesium minerals are removed but sodium is released in their place. EC has not changed, so TDS meters show little if any reduction in TDS.

Reverse osmosis (RO) filtration does reduce TDS because it physically removes salts, minerals and other conducting ions from the water. The TDS of reverse osmosis water should be much lower than the untreated water feeding the RO system. A properly functioning reverse osmosis system will remove from 70% to 99.9% of the TDS. When an RO system starts removing less than 70% of the incoming TDS, it is time to replace the reverse osmosis membrane and have the system serviced.

Example Calculation

Incoming water: 300 ppm TDS

RO water: 30 ppm TDS

90% of the TDS is being removed. = OK

If RO water = 120 ppm TDS, only 60% TDS is being removed. System needs service.

How to test the TDS of tap water

Turn on the cold water and let it run for about one minute. Take a water sample in a clean plastic or glass container. Place the TDS meter in the sample and wait for the reading to stabilize. Gently swirling the meter will help prevent water bubbles from collecting near the two metal probes. Rinse the TDS meter with clean water after each use.

How to test bottled water

“Bottled water” is a generic term with no definition other than it is water in a container. Spring water, distilled water, filtered water and purified water do, however, have specific legal definitions. Testing the TDS of bottled water is similar to testing tap water. Pour a sample in a clean container. Place the TDS meter in the water, swirl and wait for the reading to stabilize. Distilled water will have a TDS of zero. Spring water, purified water and filtered water, on the other hand, can contain a high level of minerals and salts, which affect the TDS. It is not unusual for bottled water have a TDS of 100 ppm or higher.

TDS and aquariums

Aquarium hobbyists keep and breed hundreds of kinds of tropical fish in their aquariums. Some South American river fish and plants that thrive in water containing almost no minerals (low TDS). African lake fish live in high TDS water containing lots of calcium, sodium and chloride. TDS measurement will indicate if the minerals, salts and other compounds are building up over time. If the TDS climbs above normal levels, a water change is required.

Ideal TDS range for aquarium fish and ornamental pond fish

350-400 ppm African lake cichlids

200-500 ppm Goldfish, Japanese koi

10-100 ppm Angelfish, Discus, Neon tetras

100-300 ppm Guppies, Swordtails, Mollies, Barbs

Testing TDS in aquarium water

Testing the TDS in an aquarium is easy with a TDS meter. Simply place the meter into the aquarium, preferably near flowing water. Hold the TDS meter until the reading stabilizes. Thoroughly rinse the meter after each use. Aquarium water contains salts, algae and other microbes that must be rinsed from the probe after each use. TDS measurements are not necessary for saltwater aquariums.

TDS and pools & spas

The ideal TDS level in pools and spas is an area of debate. Most experts agree that the maximum TDS of a freshwater pool or spa should be no higher than 1,500 ppm. As pool chemicals are added the TDS can climb closer to 3,000 ppm. Saltwater pools that use a salt generator normally have a TDS level of 3,500 ppm up to 5,000 ppm. TDS measurement is helpful for detecting a trend of increasing TDS, which indicates a build-up of minerals or pollutants in the water. Simply place the TDS meter in the water and gently swirl.

Measuring salt levels

TDS meters can be used for estimating salt levels by using a conversion factor. Multiply the TDS level by 0.9 to obtain a ppm salt level. This is a rough approximation of the actual NaCl level. Salt meters are really TDS meters that automatically perform this calculation. Note that some manufacturers use a different conversion factor to calculate the salt level. You may find that another meter will provide a different salt level due to this factor.

How to care for your Health Metric TDS meter

Your Health Metric TDS meter is protected in a rugged plastic case but the meter should not be submerged under water. Only the probe section should be immersed in water.

- The TDS meter has two metal probes and a tiny plug on the bottom of the meter. Do not scrub or bend the probes.
- Never dip the meter into substances that can coat and damage the probes Paint, glue and other sticky substances can damage the probes.
- Never dip the TDS meter into boiling liquids. It will damage the probes.
- When you are finished using your TDS meter, rinse the probe with water, preferably distilled water. The idea is to flush away any contaminants on the probes.

HEALTH METRIC

Our water quality experts are available to provide support for all Health Metric products and answer your questions about water testing, understanding test results, water filtration .

For product and technical questions: support@health-metric.com

www.health-metric.com