

Application Bulletin

HYDROPONICS



WHAT IS HYDROPONICS?

"A technique of growing plants in nutrient solution". Hydroponics literally means water-working or water-activation. It is a cultivation technique for growing plants in highly oxygenated, nutrient enriched water, rather than soil.

The nutrient solution and its management are the cornerstone for a successful hydroponics system. The function of a hydroponics nutrient solution is to supply the plant roots with water, oxygen and essential mineral elements in soluble form.

In soil, biological decomposition breaks down organic matter into basic nutrients that plants feed on. Water dissolves these nutrients which allows uptake by the roots. For a plant to receive a well balanced diet, everything in the soil must be in perfect balance.

Depending on the product, there are approximately seventeen (17) required elements for proper growth. For growth of higher plants, nine of these elements (macro nutrients) carbons, hydrogen, oxygen, sulfur, phosphorus, calcium, magnesium, potassium, and nitrogen are required in relatively large amounts. The remaining eight elements (micro-nutrients or trace elements) iron, zinc, copper, manganese, boron, chlorine, cobalt, and molybdenum are needed in only minute amounts.

To support a plant in a system, an inert medium like fiber or leca, may be used to anchor the roots. These mediums are designed to be very porous for excellent retention of air and water for healthy plants-roots to breathe! With the proper light exposure, nutrients, pH and EC/TDS measurements, plants will grow many times faster, bigger and healthier.

WHAT IS pH? WHY IS IT IMPORTANT?

pH, means "potential of hydrogen". It is a measure of hydrogen ion activity in a particular medium (such as water, soil, etc.) and is commonly referred to as the measurement of acidity or basicity. All elements have a specific solubility pH range. This means that mineral elements can become more available for plant uptake within certain pH ranges.

The scale of pH is 0 to 14, 14 is the highest basicity, 7 is neutral, and 0 is the highest acidity. It is well documented that growing media pH is critical to successful plant growth. This is especially true for soilless mixes and hydroponics.

Extreme pH conditions such as very low pH (below pH 4.5) and very high pH (above pH 9) can cause damage to plant roots and limit or kill production.

WHAT IS ELECTRICAL CONDUCTIVITY (EC) OR TOTAL DISSOLVED SOLIDS (TDS)?

WHY IS IT IMPORTANT?

EC [displayed in either microsiemens (μ S) or micromhos (μ M)] is the measurement of the nutrient solutions ability to conduct an electrical current. In hydroponics the conductivity (EC) is most commonly expressed in an equivalent Total Dissolved Solids (TDS) value. The unit of measurement for TDS is parts per million (ppm). Pure water (deionized water) is actually an insulator — it does not conduct electricity. It is the conductive substances (or ionized salts) dissolved in the water that determine how conductive the solution is. With few exceptions, when there is a greater concentration of nutrients, the electrical current will flow faster, and when there is a lower concentration, the current will flow slower.

This is because the quantity of dissolved solids in the nutrient solution is directly proportional to the conductivity. Thus, by measuring the EC, one can determine how strong or weak the concentration of the nutrient solution is.

HOW IS EC CONVERTED TO PPM OF TDS?

Myron L[®] Company instrumentation uses a complex equation that exactly matches the true TDS of the solution being tested. While other instrument manufacturers use a "fixed" factor (easier and less costly to manufacture) to "estimate" the TDS from electrical conductivity. As you can see in the following examples a fixed factor of, for example .5 is far off the mark.

TEMPERATURE COMPENSATION (TC), WHY IS IT IMPORTANT?

Without Temperature Compensation (TC), instrumentation measuring waters/nutrients would be indicating different values at differing temperatures. TC standardizes the readings at the international standard of 25°C/77°F. With proper TC all readings will be repeatable at differing temperatures and may be correlated. All Myron L[®] instruments use advanced TC circuitry and equations to give you the best TC correction available.

MYRON L[®]
COMPANY
Water Quality Instrumentation
Accuracy • Reliability • Simplicity

CALIBRATION STANDARD SOLUTIONS

Clearly the “BEST” choice when calibrating TDS instrumentation for controlling water and nutrients in Hydroponics, Greenhouses and Agricultural applications is the “442™” Natural Water Standard.

This standard developed over 50 years ago by the Myron L® Company closely matches the composition of natural water. The “442” refers to the combination of salts with deionized water to make the standard: 40% sodium sulfate, 40% sodium bicarbonate, and 20%

sodium chloride. Since its development, it has become the world’s most accepted natural water standard. All HYDROPONICS TDS instruments from the Myron L® Company are calibrated using this standard.

For truly accurate and repeatable readings for your hydroponic applications, use Myron L® Company instrumentation and “442” Standard Solutions.

All instrumentation, pH buffers and EC/TDS standards are available from the Myron L® Company and our worldwide distribution network.

Standard Solution	EC = ppm or TDS	Factor
Pure Water	0 = 0	0
442-15	23.8 $\mu\text{S}/\mu\text{M}$ = 15 ppm	.63
442-300	445 $\mu\text{S}/\mu\text{M}$ = 300 ppm	.67
442-1500	2060 $\mu\text{S}/\mu\text{M}$ = 1500 ppm	.73
442-3000	3900 $\mu\text{S}/\mu\text{M}$ = 3000 ppm	.77
442-30,000	30,100 $\mu\text{S}/\mu\text{M}$ = 30,000 ppm	.997

The following table lists some of the recommended Myron L® instruments for the hydroponics industry. For additional information, please contact your local distributor, refer to Myron L® data sheets, visit our website at www.myronl.com, or contact us by phone, fax, or email (sales@myronl.com).

INSTRUMENT	PARAMETER				
	EC/Conductivity ($\mu\text{S}/\text{mS}$)	TDS (ppm/ppt)	pH	Dissolved Oxygen	Nitrate
Handheld Instruments					
DS Meter™ 512T4		X			
pDS Meter™ T6/PH		X	X		
TechPro II™ TP1	X	X			
TechPro II™ TPH1	X	X	X		
Ultrameter II™ 4P	X	X			
Ultrameter II™ 6PFC ^E	X	X	X		
Ultrameter III™ 9P	X	X	X		
Ultrapen™ PT1, PTBT1	X	X			
Ultrapen™ PT2, PTBT2			X		
Ultrapen™ PT5, PTBT5				X	
Ultrapen™ PT6, PTBT6					X
In-line Monitor/Controllers					
900M-1C Touchscreen Controller	X	X	X		
900M-3C Touchscreen Controller	X	X	X		
758II-XXX Digital Controller*	X	X			
723II Digital Controller			X		

*Range is specified when ordering.

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Built On Trust. Founded in 1957, the Myron L® Company is one of the world’s leading manufacturers of water quality instruments. Because of our commitment to product improvement, changes in design and specifications are possible. You have our assurance any changes will be guided by our product philosophy: accuracy, reliability, and simplicity.

