

An Introduction to Laboratory Water Purification



A high-purity DI polisher that incorporates multi-pass UV for microbial-free water, two-stage deionization and a full-size, 0.2- μ m filter. It produces water that meets or exceeds the most stringent water quality standards.



A high-purity DI loop for general laboratory water purification offers full recirculation with three cartridges. It's shown here with recirculation dispensing gun and 0.05- μ m capsule filter.

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Summary: Scientists use deionized water in a variety of areas. To provide the proper deionization system, it's important to understand the specific needs and requirements of laboratory grade water. Laboratory water systems come in standard configurations with a variety of available options.

Every laboratory has a need for purified water. Scientists use deionized water in a variety of areas from glassware washing to DNA synthesis. While some laboratories are stand-alone businesses, many operate within a larger business. These captive labs are the quality control or research and development (R&D) centers for high-tech industries.

The laboratory water purification market includes hospitals, universities and research companies. Other markets include pharmaceutical, electronics, forensics and environmental firms. Many of these companies purchase purified laboratory grade water at significant expense, freight and storage space. Lab water purification systems are an excellent way to provide reagent grade water on demand. While there's a vast spectrum of end-users, a similar design and approach can be applied for laboratories requiring water purification.

Assessing impurities

In order to provide the proper purification system, it's important to understand the specific needs and requirements of laboratory grade water. Understanding water impurities that affect laboratory testing is critical to servicing this market. Aside from the conventional impurities such as suspended solids, dissolved solids and gases, laboratory water systems may have to meet specific standards for resistivity, organics, bacteria, pyrogens, and nucleases.

Resistivity

Resistivity is measured by passing an electrical current through the water. Resistivity is a measurement of the mineral content of the water. Lab systems should produce water with a resistivity of 18+ megohm-cm.

Organics

Organic contaminants are residuals from natural plant and animal decomposition. Organics can also be synthetic compounds from pollution. Naturally occurring compounds include tannic, humic and fulvic acids. Total organic carbon (TOC) is a measure of both natural and synthetic substances. Organics removal can be of primary concern to the scientist depending upon the nature of their work.

Bacteria

Bacteria is a class of microscopic organisms that reproduce by fission or spores. There are many different types of bacteria. Some bacteria are self-sustaining while others survive on non-living material. The amount of bacteria generally measured by culturing the sample and counting the active colonies.

Pyrogens

Pyrogens are endotoxins created from an organism's fragmented cell walls and are measured in endotoxin units (EU). Their presence is determined by using the limulus amoebocyte lysate (LAL) test. The LAL test uses the blood of the horseshoe crab that clots in the presence of endotoxin.

Nucleases

Nucleases—Rnase (ribonuclease) and Dnase (deoxyribonucleases)—are enzymes that degrade DNA and RNA. The need for Rnase/Dnase free water is critical in microbiology where the test sample cannot be compromised with foreign DNA matter.

There are a few organizations within the analytical industry that provide water purification standards for laboratory use (see FYI). The College of America