HUBBELL
a **nudyne** company

Deionized Water
Quick Facts

What Is Deionized (DI) Water?

Deionized water, commonly known as DI Water, is ultra pure, neutral water. It is void of impurities such as calcium, chlorides, iron, magnesium, sodium, aluminum, and other minerals. The absence of these ions significantly increases the purity of the water, which minimizes the risk of unwanted chemical reactions occurring.

Electrical Conductivity

We can't have a discussion about DI water without mentioning conductivity. The principle is fairly simple: the lower the purity of the water, the more easily it conducts electricity. This results from the higher salt and/or mineral content. Is this a help or hindrance? It depends on the requirements of the application.

And while we are on the topic of conductivity, let's quickly talk about resistivity. This is the inverse of conductivity. More specifically, it is the measure of how strongly water resists the flow of electrical current. It's typically expressed in ohm-centimeters (Ω·cm) or megohm-centimeters (MΩ·cm). The higher the resistivity, the purer your water because there are fewer ions present.

Lower Resistivity	Low-Medium Resistivity	High Resistivity
.05-.8 Meohms Tap water-high amount of ions present. Not pure.	Around 6.7 Megohms Ideal for process applications-parts rinsing, humidification systems. High purity.	10-18.2 Megohms Best suited for pharmaceutical and computer applications. Ultra-pure.

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Common Applications

Reverse osmosis/deionized (RO/DI) water is ideal for uses when water with zero "unknowns" is needed. Typical applications range from simple parts washing to more demanding ones in the pharmaceutical, medical, electronic, and food service industries. Below are some specific examples.

- **Medical & Pharmaceutical** – used to make sterile solutions, clean surgical tools, and as an ingredient in medications where impurities can't be present.
- **Electronics & Semiconductor Manufacturing** – rinses wafers and other delicate components to ensure that no conductive ions or mineral deposits interfere with circuits.
- **Cosmetics & skincare production** – A pure and neutral water base is a must to ensure product stability and consistency without undesired reactions from minerals or chlorine.
- **Hydroponics & Controlled Agriculture** – growers start with RO/DI water, then add back precise nutrients to this clean base, giving them consistency and complete control.

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The Di Process

We could easily produce a separate eBook detailing the deionization process, but since we're doing quick facts, today we'll look at the high-level process steps:

- **Mechanical filtration** – during this initial phase, particulates are mechanically removed from the water.
- **Adsorption (carbon)** – next, the water passes through carbon, which removes chlorine, chloramine, and organics.
- **Membrane separation (RO)** – then the water passes through a semi-permeable barrier, where ~95–99% of dissolved ions and molecules are removed via reverse osmosis. We're almost there!
- **Ion exchange (DI)** – finally, the last trace ions are removed by swapping them for H^+ and OH^-, yielding pure H_2O.

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How Does Deionization Measure Up to Other Purification Methods?

In addition to DI, users of purified water may also consider distilled water or filtered water. Let's take a quick look at these two processes.

Distilled Water – is boiled into steam, then condensed. Great for less demanding applications where low-cost purity is needed, such as irons and CPAP machines.

Filtered Water – is either physically or chemically filtered. It works well when better tasting water is desired, such as coffee making and cooking.

Type of Water	Purification Method	Purity Level	What's Removed	Common Uses	When to Choose
RO/DI Water	RO membrane removes most contaminants: DI resin trips out remaining ions	Ultra-pure (near 0 TDS)	Salts, minerals, metals, chlorine, organics	Aquariums, labs, medical, electronics, hydroponics	When you need absolutely contaminant-free water
Distilled Water	Boiled into steam, then condensed	Very pure, but can still contain volatile chemicals	Minerals, salts, metals, most microbes	Steam irons, CPAP machines, car batteries, some labs	When you want low-cost purity but not as strict
Filtered Water	Physical and/or chemical filtration	Moderately pure	Sediment, Chlorine, some organics	Drinking water, cooking, coffee makers	When you just want better taste

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Water Heater Material Options

There's certainly no shortage of material options when it comes to water heaters. Many consumers looking for an RO/DI water heater assume they need expensive construction materials such as titanium or Teflon® coating, but there are other options that yield the same results. Conversely, other options may save some money, but not provide acceptable results. Options typically include:

Cement – while this could be more budget friendly, unfortunately, cement contains minerals that will leach into and contaminate the water.

Glass – on quick thought, this seems like a great option. But in reality, glass is porous and breaks down quickly as a result. They also require anode rods made of metals which contaminate, and work against the mission for purity.

Stainless Steel – is one of the best choices as it resists corrosion, lasts long, and is economical. It's the trifecta, offering most consumers the perfect balance between performance and cost.

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Stainless Steel: The Cost-Effective Choice

If your purified water application requires ultra purity and consistency, without surprises –you'll need RO/DI water. More demanding applications may need higher-grade materials. But for most uses, stainless steel is the better option – delivering reliability without the sticker shock.