WHITEPAPER: UV DISINFECTION FOR

Failed Water Tests

SINCE 1963 ATLANTIC ULTRAVIOLET CORPORATION®

What is a Water Test?

A water test analyzes contaminants and water quality indicators (WQIs) found in your public or private water supply. A failed water test may indicate that there is too much of a harmful microorganism in the water, rendering it unsafe to drink or use. While changes in the water's appearance, taste, and smell are easily recognizable, the EPA states that potentially severe contamination from bacteria, heavy metals, nitrates, radon, and other chemicals can only be determined through testing.[1]

Issues with Public Water

In the U.S., the Safe Drinking Water Act (SDWA) regulates the public water supply to protect against naturally-occurring and man-made contaminants. But In a 2017 study, the NRDC found that many communities aren't maintaining their aging infrastructure as the act requires. It also highlighted weaknesses in standards for certain contaminants such as lead.[2]

"Our research shows that in 2015 alone, nearly 77 million people were served by more than 18,000 community water systems that violated at least one SDWA rule, and there were more than 80,000 violations of SDWA rules that year."

Natural Resource Defense Council, "Threats on Tap" [2]

Issues with Well Water

After a study of over private 2,000 wells, the U.S. Geological Survey found that about 23 percent had at least one contaminant at a level of potential concern.[3] As of 2021, more than 23 million U.S. households use private wells, and homeowners are responsible for overseeing the safety and quality of their well water.[4] Experts recommend testing well water annually, and more often if observing any of the following conditions:

- Water that is off color, cloudy, or has an odor
- Reduction in water pressure
- Floods, storm surge, or tornado activity
- Local mining or construction activity
- Known issues with neighboring septic systems
- Pipe/pump repairs or work done on your well

How UV-C Works

UV light is made up of three wavelength ranges (UV-A, UV-B, and UV-C). UV-C lamps produce rays at 254 nanometers, making harmful microorganisms unable to reproduce, and hence inactive. Unwanted microbes eventually die off, making water safer and healthier.

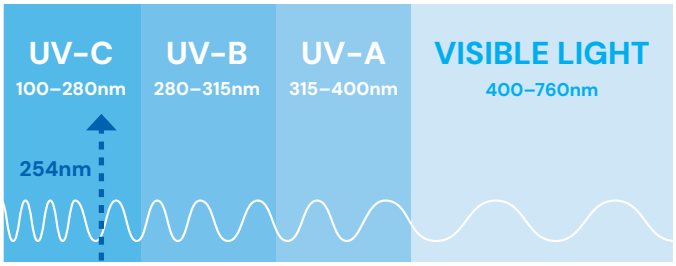

Figure 1: A Portion of the Electromagnetic Spectrum

Water Test Baseline for UV Purifiers

UV purifiers are intended for use with water that is visually clear—not colored, cloudy, turbid, or having an obvious contamination source. Water quality plays a major role in the transmission of UV-C rays. In order to achieve the minimum UV transmission level of 85% per centimeter, do not exceed these maximum concentration levels:

Characteristic	Maximum Level
Turbidity	5 NTU
Manganese	0.05 mg/L
Total Suspended Solids	30 mg/L
Biological Oxygen Demand	30 mg/L
pH	6.5–9.5
Color	None
Hardness	6 gpg or 102.6 ppm
Iron	0.3 mg/L
Tannins	< 0.1 ppm (0.1 mg/L)

Table 1: Maximum Concentration Levels for UV Treatment

Effectively treating water with higher concentration levels (or a lower UV transmission) can be accomplished, but will require added measures to improve water quality. Contact our UV specialists at (631) 273-0500 for help.

UV-C Doses

A proper UV transmission level will ensure your water purifier delivers a UV-C dose of 30 mJ/cm^2, which is high enough to neutralize many harmful microorganisms commonly found in contaminated water supplies. Millijoules per square centimeter (mJ/cm^2) is the measurement of energy produced by germicidal UV lamps over a certain amount of time.

Microorganism	UV Dose (mJ/cm^2)
Giardia	100.0
Shigella	7.0
Cryptosporidium	5.8
Hepatitis A	8.0
E. coli	6.6
Salmonella	7.6
Rotavirus	24.0

Table 2: UV-C Doses to Neutralize Waterborne Microbes

Sizing a UV Purifier

First, find your maximum flow rate in gallons per minute (GPM). Flow rates will depend on your water pressure, the size of your water lines, and the number and type of water outlets. A home with 3/4″ water pipes will generally have a maximum flow rate of about 7 GPM. Larger homes with 1″ pipes could reach 15 GPM or higher.

We recommend a 6 GPM purifier for homes with 1 bathroom, 12 GPM for 2–4 bathrooms, and 20 GPM for 5 bathrooms. If your flow rate is in between two models, purchase the larger size.

Point of use purifiers will be installed directly at the site of use, such as under a sink. Point of entry models will be installed where the water enters your home or facility, providing continuous disinfection to all water plumbed downstream of the UV purifier. UV models designed for higher flow rates (such as an entire building) will generally be larger, while point of use purifiers will be able to fit in small spaces.

Installation

Location

Install the water purifier in a dry, well-lit area which provides enough room for routine maintenance. This includes a minimum distance of one chamber length from the chamber end, to allow for cleaning and/or changing of the lamp and quartz sleeve, as well as a minimum of 6” on the opposite end of the water purifier. Minimum clearance to the floor is usually between 18 and 30 inches.

Pre-Treatment Devices

As shown in the diagram on the next page, your water purifier should always be installed after any other treatment devices such as deionizers, water softeners, carbon/sediment filters, pressure tanks, pumps, and reverse osmosis systems (whether installing at the point of use or point of entry). This practice eliminates the possibility of the purified water being re-contaminated by bacteria in any of these units.

Additional Considerations

- Use of metal pipe is recommended for connecting to both the purifier inlet and outlet 12” past the first elbow (to avoid degradation of exposed plastic pipe).
- Always use a mounting bracket and never leave a UV water purifier’s plumbing connections to support its weight. Atlantic Ultraviolet water purifiers are designed to mount horizontally.
- Install a drain pan under the water purifier for added protection against leaks.
- Always connect the purifier to the cold water line, with the water temperature between 50 and 100°F (10–37°C).

Disinfecting the “Downstream” Plumbing

Before completing the plumbing connections to the water purifier, it is a good practice to disinfect the plumbing between the purifier and point of use. This is done by introducing chlorine or other disinfectant solution into the purifier chamber; 100 ppm of chlorine is suggested. With the disinfectant in the purifier chamber, turn the germicidal ultraviolet purifier on. Open the “downstream” outlet until a chlorine or disinfectant solution odor is noticed. Close the outlet and allow the disinfectant to remain in the plumbing for three (3) hours. Flush the plumbing with germicidal ultraviolet purified water; allow the water to run for a minimum of 5 minutes prior to use (to ensure no chlorine or disinfectant smell can be detected). This will allow the chlorine or disinfectant solution to be flushed from the pipes.

Table 3: Comparison of UV Water Purifier Models

Feature	Bio-Logic®	Minipure®	Mighty Pure®	Sanitron®
Flow Rate (GPM)	1.5 or 3	1–9	3–20	3–40
Min. Clearance (Lamp/Quartz)	13⅞–19½"	10⅜–29"	16–49"	17–50"
Min. Clearance (Gland Access)	6"	6"	6"	6"
Lamp Indicator LEDs	✓	✓		
Point of Use Models	✓	✓	✓	✓
Point of Entry Models		✓	✓	✓
Sight Port		✓	✓	✓
Drain Fitting			✓	✓
Dual-Action Wiper				✓
UV Monitor			Optional	Optional
Audio Alarm	Standard	Standard	Optional	Optional
Solenoid Valve		Optional*	Optional	Optional
Flow Control Valve	Optional	Optional	Optional	Optional

*Available for Models MIN-3, MIN-6, and MIN-9 only.

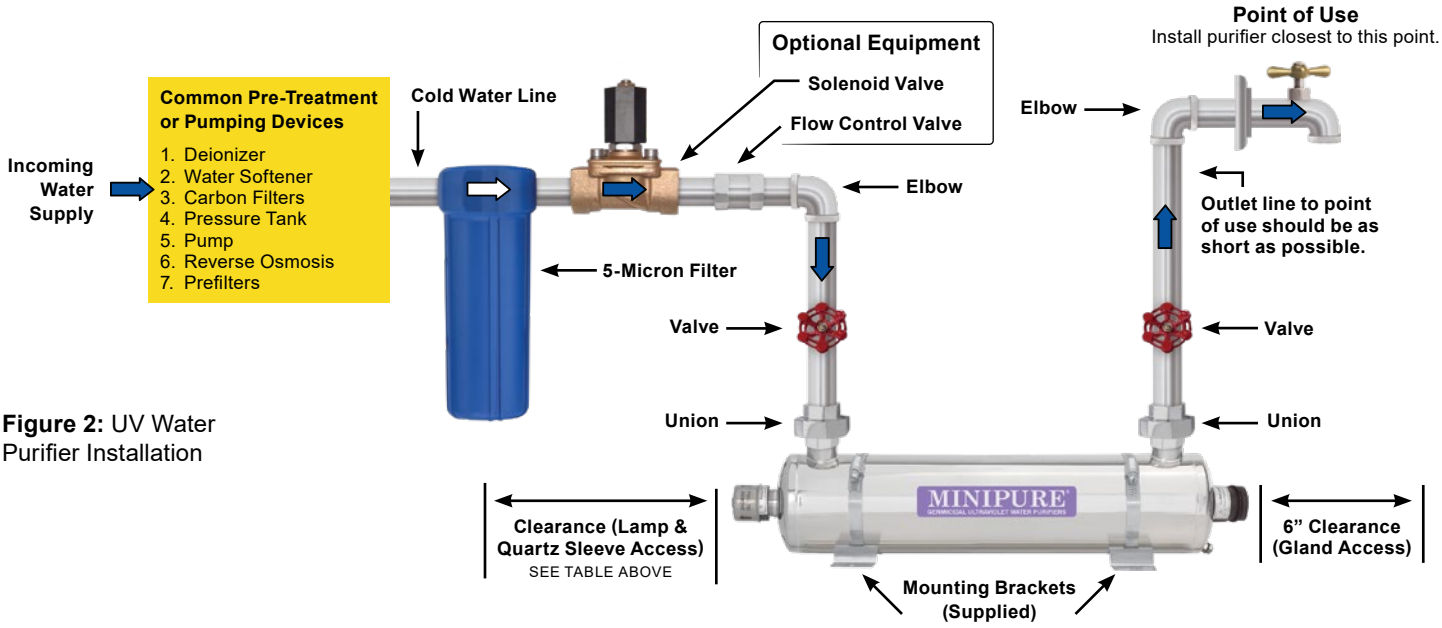

Figure 2: UV Water Purifier Installation

Sources

1. EPA. "Drinking Water From Household Wells." https://19january2017snapshot.epa.gov/sites/production/files/2015-05/documents/epa816k02003.pdf
2. NRDC. "Threats On Tap." https://www.nrdc.org/sites/default/files/threats-on-tap-water-infrastructure-protections-report.pdf
3. USGS. "Quality of Water from Domestic Wells in Principal Aquifers of the United States, 1991–2004." https://pubs.usgs.gov/circ/circ1332/
4. EPA. "Drinking Water Data & Tools Guide." https://www.epa.gov/DWdata/drinking-water-data-tools-guide#who-provides-my-drinking-water

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