



# **WATER FOR INJECTION** **LIQUID MONITORING FOR PHARMA**

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Lighthouse Worldwide Solutions



## Overview

Different grades of water quality are required depending on the different pharmaceutical uses.

Water for Injection (WFI) may be present as an excipient or used to reconstitute products; therefore, contaminated water should not come near your product. But how do you know your water is contaminated, or contamination levels rise?

With a continuous sampling of loop systems, operators and managers can be notified immediately if base levels rise, compromising product quality and safety with a Liquid Particle Monitoring System. Real-time LPCs can be easily installed along with the water systems based on a risk assessment. This paper outlines liquid monitoring in pharmaceuticals and gives you insight on establishing a Contamination Control Strategy as outlined in EU GMP Annex1.

# Pharmaceutical Water Quality Requirements For Use in the Cleanroom

Water is one of the major utilities used by the pharmaceutical industry. Different grades of water quality are required depending on the different pharmaceutical uses. Control of the quality of water, in particular the microbiological quality, is a major concern, and the pharmaceutical industry devotes considerable resources to the development and maintenance of water purification systems.

Water for Injection (WFI) may be present as an excipient or used for reconstitution of products, during synthesis, during the production of the finished product, or as a cleaning agent for rinsing vessels, equipment, primary packaging materials, etc. Therefore, sterile water free of viable contamination is a necessity for the quality of the end pharmaceutical product.

In April 2017, the production of Water for Injections (WFI) had been limited to production by distillation only. However, with the revision of the European Pharmacopeia monograph for Water for Injections (0169). The production of WFI by a purification process using reverse osmosis using electro-deionization or nanofiltration.

## Pharmaceutical Grade Water

There are four main types of water graded for pharmaceutical use. These grades have been defined by United States Pharmacopeia (USP) and European Pharmacopeia (Ph. Eur).

1

Potable (Mains) Water



2

Purified Water



3

Highly Purified Water



4

Water For Injection (WFI)





## What is Potable (Mains) Water?

Potable or mains water is typically the primary source for all other grades of water. This type of water has no direct contact with the product.





## What is Purified Water?

Purified water is water that has been mechanically filtered or processed to remove impurities and make it suitable for use. Distilled water has been the most common form of purified water. But in recent years, water is more frequently purified by other processes, including capacitive deionization, reverse osmosis, carbon filtering, microfiltration, ultrafiltration, ultraviolet oxidation, or electro deionization. Combinations of a number of these processes have come into use to produce ultrapure water of such high purity that its trace contaminants are measured in parts per billion (ppb) or parts per trillion (ppt).

## What is WFI?

Water for Injections (WFI) is water for the preparation of medicines for parenteral administration when water is used as a vehicle (water for injections in bulk) and for dissolving or diluting substances or preparations for parenteral administration (sterilized water for injections). Water for injection is water of extra high quality without significant contamination. A sterile version is used for making solutions that will be given by injection.

### Categories of Sterile Products and Minimum Acceptable Quality of Water

 Sterile Medicinal Products	 Minimum Acceptable Quality of Water	 Non-Sterile Medicinal Products	 Minimum Acceptable Quality of Water
Biologics <sup>1</sup>	WFI	Vaccines for Non-Parenteral Use	Purified Water <sup>1</sup>
Parenteral	WFI	Oral Preparations	Purified Water
Ophthalmic <sup>2</sup>	Purified Water	Nebulizer Solutions	Purified Water <sup>2</sup>
Haemofiltration Solutions	WFI	Cutaneous Preparations	Purified Water <sup>3</sup>
Haemodiafiltration Solutions	WFI	Nasal/Ear Preparations	Purified Water
Peritoneal Dialysis Solutions	WFI	Rectal/Vaginal Preparations	Purified Water
Irrigation Solutions	WFI		
Nasal/Ear Preparations	Purified Water		
Cutaneous Preparations	Purified Water		

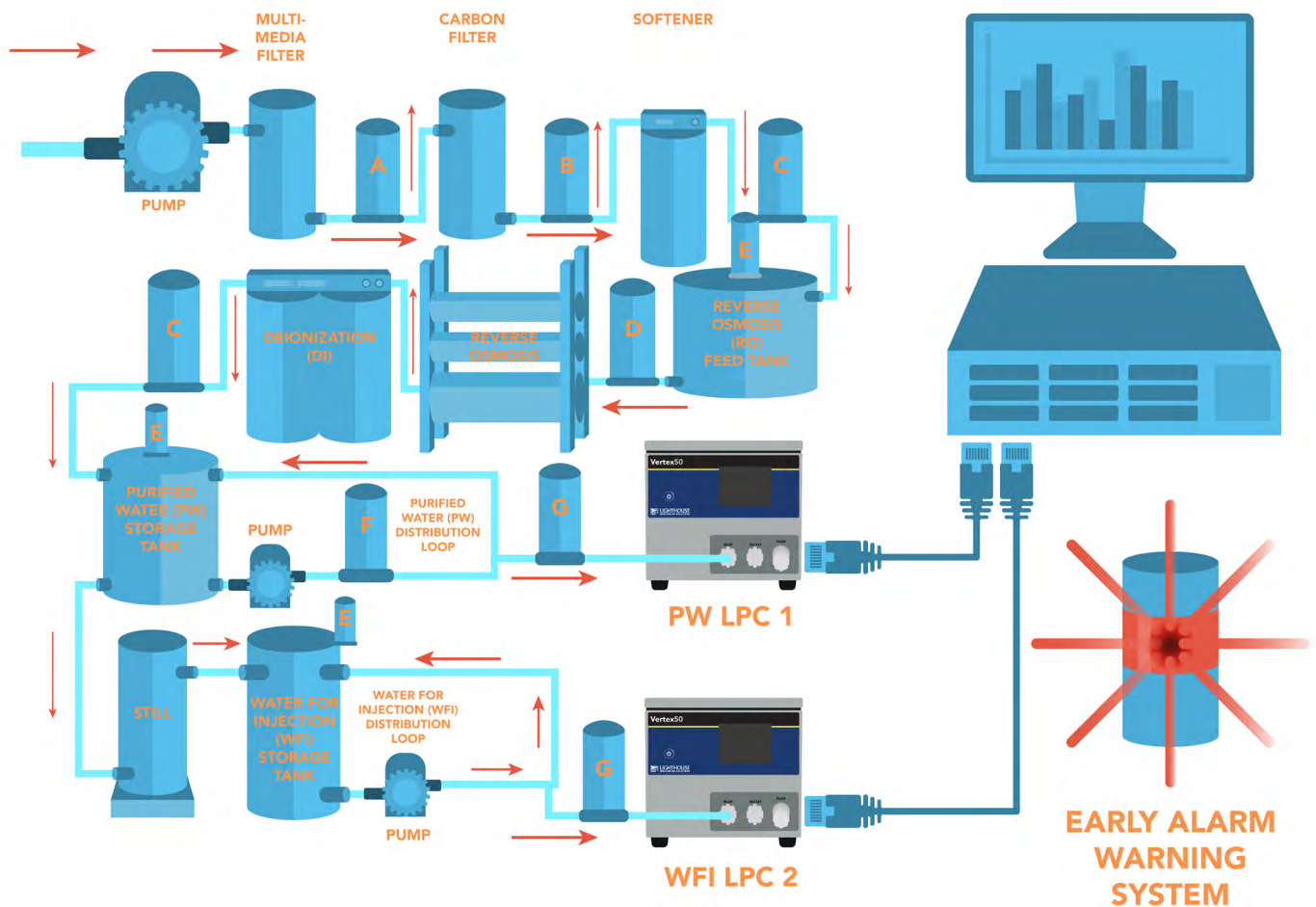
<sup>1</sup> Including vaccines and ATMP  
<sup>2</sup> Excluding ATMP

<sup>1</sup> WFI is recommended in order to ensure the vaccines' safety and product quality (avoid the introduction of undesirable microorganisms in the finished product formulation) unless otherwise justified (i.e., for some non-sterile veterinary vaccines for non-parenteral use, purified water might be accepted).

<sup>2</sup> In certain disease states (e.g., cystic fibrosis), medicinal products administered by nebulization are required to be sterile and nonpyrogenic. In such cases, WFI should be used.

<sup>3</sup> For some products such as veterinary test dips, it may be acceptable to use potable water where justified and authorized, taking account of the variability in chemical composition and microbiological quality.

# WFI and Purified Water System With Online Particulate Monitoring



With GMP's new updates pushing for a complete facility **Contamination Control Strategy** outlined in the recent EU GMP Annex1: 2021 update. Monitoring Purified Water and WFI systems using liquid particle counters (LPC) aid in your strategy by enabling fast notification of contamination with continuous sampling of loop systems. Operators and managers can be notified immediately if base levels rise which can compromise product quality and safety.

The system above shows two monitoring points one on the Purified Water distribution loop (LPC1) and the WFI distribution loop (LPC2).

More monitoring points can be added to other pre-filtration stages to get an earlier indication of failure points for a more robust system which can act as an early warning system. The last thing an operator needs is contaminated WFI or Purified water circulating around sterile products.

# Online Liquid Particle Monitoring

Point of use remote liquid particle counters can be easily connected online and capture important data in real-time. Notifications can be issued immediately to end-users.

Remote LPCs can be easily installed along the water systems based on a risk assessment. Multiple points can be monitored to look at filtration or system failures. Most pharmaceutical water systems use process filtration and reverse osmosis with deionized systems with filtration pore sizes of 0.2 $\mu$ m with some down to 0.1 $\mu$ m.



Remote LPC (0.1 $\mu$ m)

## Why use a LPC Monitoring System?

A liquid monitoring system is easy to install and manage to give you access to reliable, actionable data, maximizing system uptime and increasing product yield.

- **Implement a real-time contamination control solution**
- **Establish baseline trends and set alarm notifications**
- **Real-Time data – apply data analytics to develop system service strategies**
- **It helps maximize system uptime and save costs**
- **The improved quality yield of product**
- **Reliable data to make informed process decisions**
- **Prevents contaminated water accidental usage**
- **Easy to install and manage**

**CONTACT US TO LEARN MORE ABOUT OUR  
CONTAMINATION CONTROL SOLUTIONS THAT  
PROVIDE YOU WITH ACTIONABLE DATA**