

UPW Sampling Valves: Minimizing Contamination For State-of-the-Art Sample Analysis

Sampling is the fundamental step of high purity water testing. An appropriate, representative sample is critical for accurate results. Extremely low levels are only achieved by continually refining and improving our basic knowledge and understanding of sample collection. Sample valve design and set-up can be a significant hindrance to obtaining clean samples. False high data generates confusion for facilities operations personnel where port or environmental artifacts must be explained or rechecked to show the UPW system is or is not in compliance. It also wastes time and money due to resampling. Eliminating or minimizing false high hits is possible by investigating proper sample valve designs, set-up and preparation techniques.

Several sample valve types and configurations are available for high purity application. The most important factors (especially for obtaining clean bacteria samples) are a low dead volume, a smooth surface and the ability to sanitize the port surfaces. Needle valves (Fig.1 & 2) and Sanitary Sampling valves (Fig. 3) are preferred for high purity water application. Ball valves are discouraged due to potential bacteria growth in dead pockets within the valve. Diaphragm valves are also discouraged unless used wide open. They can vibrate and/or pulse at low flows, making it difficult to obtain clean samples for bacteria or particles due to pipe shake.



Figure 1



Figure 2

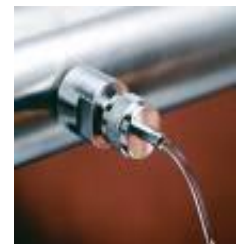


Figure 3

Ultraclean materials, such as, PVDF, PFA, and electropolished 316 SS are necessary to minimize contamination from the materials of construction. PVC is known to release TOC and chloride ions when new and has a porous/rough surface which encourages bacteria growth over time. It should be noted that trace chromium, iron and nickel have been detected with electropolished 316 SS valves when using the ultra sensitive PPQ metal analysis with preconcentration ICP-MS. SS valves which are not 316L and electropolished should be avoided for any metals testing as they will contribute higher level metal contaminants.

Port location should also be a strong consideration to eliminate or minimize contamination from the environment. Placement of the port indoors, away from walls and floors will reduce potential interference from calcium and other environmental ions. Installation far away from processes with volatile contaminants, such as acid waste neutralization is also essential. Finally, the port should be accessible for safety and ease of sampling and the location should be representative of the UPW being sampled.

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For optimum results, all sample ports should be tapped into the process line with minimal distance between the port outlet and the sampling point. Sample ports should not employ tees, pressure gauges, manifolds, etc. as they may contribute contamination. The ideal location for a UPW sample valve is directly on the main pipe at the point-of-distribution (POD). The valve should not be located near any walls, tees or flanges and upstream of any pressure gauges or flowmeters.

Sample valve and line preparation is critical to obtaining contaminant free samples. Sample lines should flow continuously for best results. The unused water can be recycled back into the water system through the return line if desired for conservation.

The sample lines should only be PFA. Many other plastic materials contaminate due to plasticizers or ionics. It is preferred that no other tubes, connections or other devices should be attached to the valve outlet for sampling purposes. It is very important that the sample valve not be adjusted until testing is completed – moving the valve generates contaminants, especially when testing for particles and bacteria.

As UPW quality can fluctuate rapidly, building an analytical database to understand the normal range of variation is recommended. It is especially important to verify outlier data points before making any major operational changes. Accurate sample collection is the key to obtaining accurate analytical data. Sub parts-per-trillion analytical analysis is only achievable by continually refining and improving our basic knowledge and understanding of sample collection.

For additional information, please contact [us](#).