



Parameter

USP 645 Water Conductivity, measuring hints

Sample Type

Ultrapure water, water for injection

Introduction

This document describes helpful measuring hints for USP <645> Water Conductivity testing.

Reference

USP <645> Water Conductivity, USP29-NF24, Page 2653, United States Pharmacopeial Convention, 12601 Twinbrook Parkway, Rockville, MD 20852-1790, USA. www.usp.org

Recommended Equipment

5Star benchtop pH/ISE/DO/conductivity meter (Orion 1010152); conductivity electrode (Orion 013016MD) with flow cell (included); printer (Orion 1010006) – optional; Star Navigator Software (Orion 1010007) - optional

Required Solutions

Alkaline detergent; 10% acetic or hydrochloric acid (optional); deionized water (DI); 100 uS/cm conductivity standard (Orion 011008)

Glassware and Equipment Cleaning

Measuring conductivity in ultrapure water is a trace analysis and best results are obtained when attention is paid to the process of cleaning and rinsing all glassware and equipment that touches the sample. Sample collection bottles should be clean and free from contaminants. The same applies to any beakers or test tubes used during testing or calibration.

Electrode Storage and Soaking

For overnight or longer, store electrodes clean and dry. Although soaking in DI is acceptable between measurements, prolonged storage in DI is not recommended, since 1) biofouling or other films can occur over time, even in clean water, and 2) the ionic pull of ultra pure water can eventually leach metals from the surface of the stainless steel probes.

Electrode Rinsing

Between measurements, rinse the conductivity electrode thoroughly with DI water and shake off excess. For best results, rinse also with a separate portion of the solution to be tested (sample or standard) before measuring the sample or standard itself.

Electrode Cleaning

If the cell constant of the conductivity electrode shows significant drift, it is possible that some process, such as biofouling or metals leaching, has disturbed the probe surface sufficiently to affect the performance. Clean the electrode with warm water and alkaline detergent for 10-30 minutes. The probe may be sonicated briefly as well. After cleaning the electrode, rinse thoroughly, and soak in DI water for 5 minutes. Repeat rinsing and soaking until the electrode is clean and free of contaminants. See the Users Guide for Conductivity Cells for an acid cleaning procedure, should the detergent step not restore the cell constant.

Low Level Conductivity Standards

Aqueous conductivity standards of less than 0.001M KCl (~149 uS/cm) are subject to change due to absorption of atmospheric CO₂. Protect these standards from the atmosphere. Once a bottle of standard has been opened, it should be used as soon as possible. For best results, use a new bottle of Orion 100 uS/cm conductivity standard for each calibration verification. Use previously opened bottles for rinsing the electrode prior to immersion in new standard.

Documentation of Results

Meter data may be captured to a printer or software for documentation of sample results. The Orion inkjet printouts provide a durable record of results that can be retained as hardcopies. Alternately, the Star Navigator software can be used to capture data to electronic files. Star Navigator also supports 21CFR11 compliance, if desired. When Star Navigator is loaded onto a computer, which is then connected to the Star meter, the user operates the meter from the computer screen and data is captured to electronic file. This data is easily stored and can be downloaded into spreadsheets and other programs, such as LIMS, for easy handling.

Linearity of Cell Constant

As noted above, aqueous conductivity standards of less than 0.001M KCl are subject to change due to absorption of atmospheric CO₂ and are susceptible to contamination during handling. These are essentially trace-level standards. Although low-level conductivity standards < 100 uS/cm are available from various manufacturers and are claimed to be accurate, NIST conductivity standards at levels from 5 to 25 uS/cm have listed uncertainties ranging from +/- 8.3 to 2.4%. Thus low-level standards are not recommended for calibration of the cell constant, which must be known to +/- 2% for USP <645>. If the conductivity electrode response is linear over the range of testing, a one-point calibration at ≥ 100 uS/cm will yield accurate results, even when measuring ultrapure water. Orion DuraProbe™ conductivity electrodes calibrated at 100 uS/cm will read flowing ultrapure water to within 0.002 uS/cm of expected values. This demonstrates excellent accuracy over the range of measurement.