

Chlorine Analyzer Calibration Verification – Ensuring Confidence in Industrial Water Quality



Hach's CL17 Chlorine Analyzer

Introduction

When used together, the Hach CL17 Chlorine Analyzer [0.03-5 mg/L Cl₂] and Low and High Range DPD lab analyses [0.02-10 mg/L Cl₂] ensure the most accurate and reliable chlorine monitoring results. The DR3900 Spectrophotometer may be used to perform low and high range chlorine measurements, as well as to measure a host of other parameters. The CL17 is an independent system ready from startup with quality reagents delivered from one single source supplier. Additionally, the CL17 may be verified with external standards measured with the DR3900. Single sourcing of reagents for each analysis eliminates variability due to reagent quality.

Background

Chlorine is used for disinfection in many industrial applications. Feedwater, process water, cooling water, and wastewater may all require disinfection, and chlorine is an effective and cost efficient solution. Maintaining the correct residual concentration of chlorine ensures effective disinfection while avoiding the costs of overdosing, as well as protecting valuable equipment and the environment. The Hach CL17 Chlorine Analyzer and DR3900 spectrophotometer provides accurate monitoring of chlorine residuals: confirming that chlorine dosing is sufficient to provide antimicrobial protection, and that chlorine has been effectively removed from discharge waters and RO membrane feedwater.



Hach's DR3900 Spectrophotometer

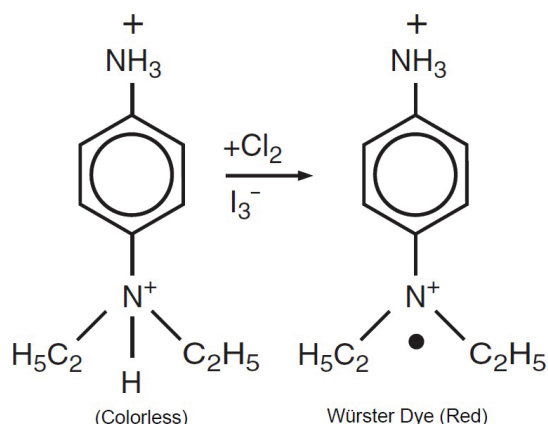


Figure 1 – Oxidation of N,N-diethyl-p-phenylenediamine

Both the CL17 analyzer and DR3900 chlorine analyses use the N,N-diethyl-p-phenylenediamine (DPD) chemistry to measure free and total chlorine. At the pH buffered by the reagents, chlorine oxidizes DPD to produce a magenta colored dye, Figure 1. The intensity of the magenta color is directly proportional to the concentration of chlorine in the sample. The color is measured photometrically at 510 and 520 nm in the CL17 and 530 nm in the DR3900. The reagents used for these analyses are all manufactured by Hach at the same facility for both the CL17 and DR3900.

Both the CL17 and DR3900 implement a built-in calibration curve. Although rare, instrument response can drift over time due to regular wear and tear. While these issues are addressed

APPLICATION: CHLORINE ANALYZER CALIBRATION PROCEDURES

Table 1: Validation characteristics

CL17	DR3900
Total Chlorine Reagents - 2557000	Low Range Total Chlorine Powder Pillows - 2105669
	High Range Total Chlorine Powder Pillows - 1406499
Free Chlorine Reagents - 2556900	Low Range Free Chlorine Powder Pillows - 2105569
	High Range Free Chlorine Powder Pillows - 1407099
Calibration Kit - 5449000	Chlorine Standards – 1426810

through regular maintenance, it is recommended that verification be performed periodically to ensure that accuracy is maintained throughout the maintenance interval.

Calibration Verification

Calibration verification can be performed by analyzing a prepared standard, or by analyzing a grab sample with a different instrument. Each of these techniques is easily performed with the CL17 and DR3900. Prepared standards can be analyzed on the CL17 through the "Calibration/Verification" function. Prepared standards measured with the CL17 and DR3900 show excellent accuracy and agreement between instruments, Figure 2. If measured values do not correlate to prepared concentrations, the measurement is inaccurate. The source of this inaccuracy must be identified and corrected. Follow troubleshooting instructions in the instrument manual and procedure.

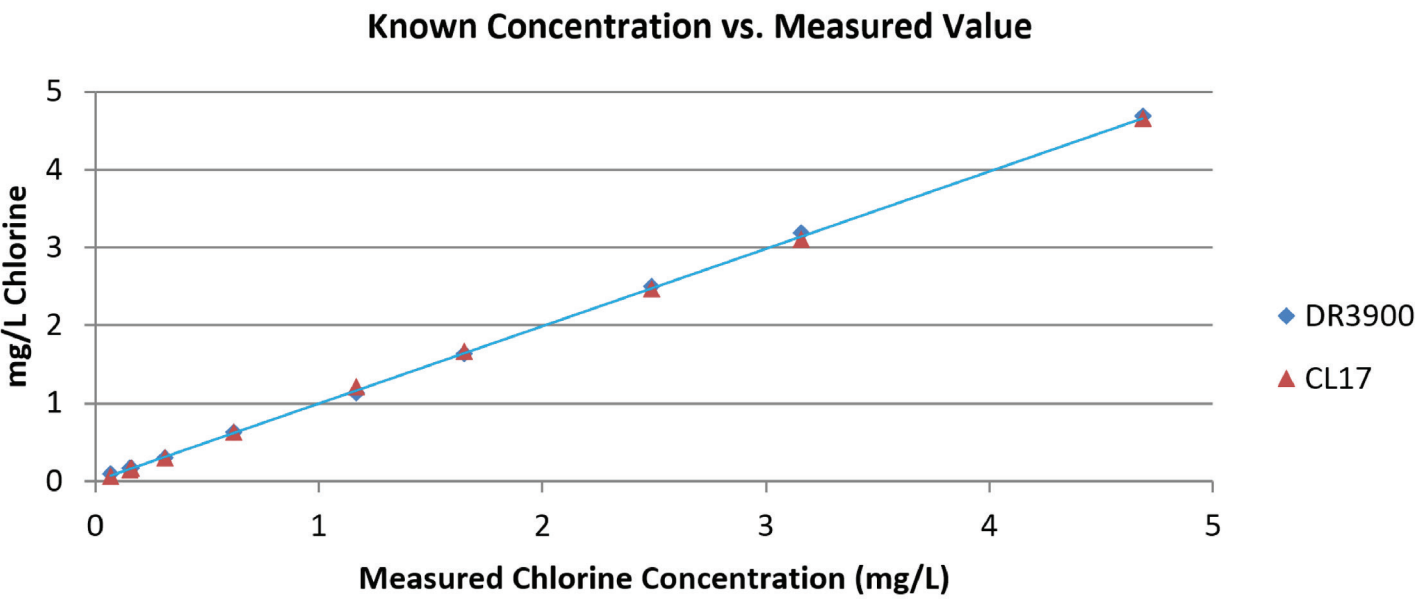


Figure 2 – Prepared Standard Verification

CL17 process samples can be verified by analyzing a grab sample with a DR3900 lab procedure. Comparison of measured results against prepared standards or between instruments will indicate maintenance issues or poor analytical technique. Standards and samples measured on each instrument show excellent agreement, Figure 3. If inter-instrument measurements do not correlate, one of the measurements is inaccurate. The source of this inaccuracy must be identified and corrected. Follow troubleshooting instructions in the instrument manual and procedure.



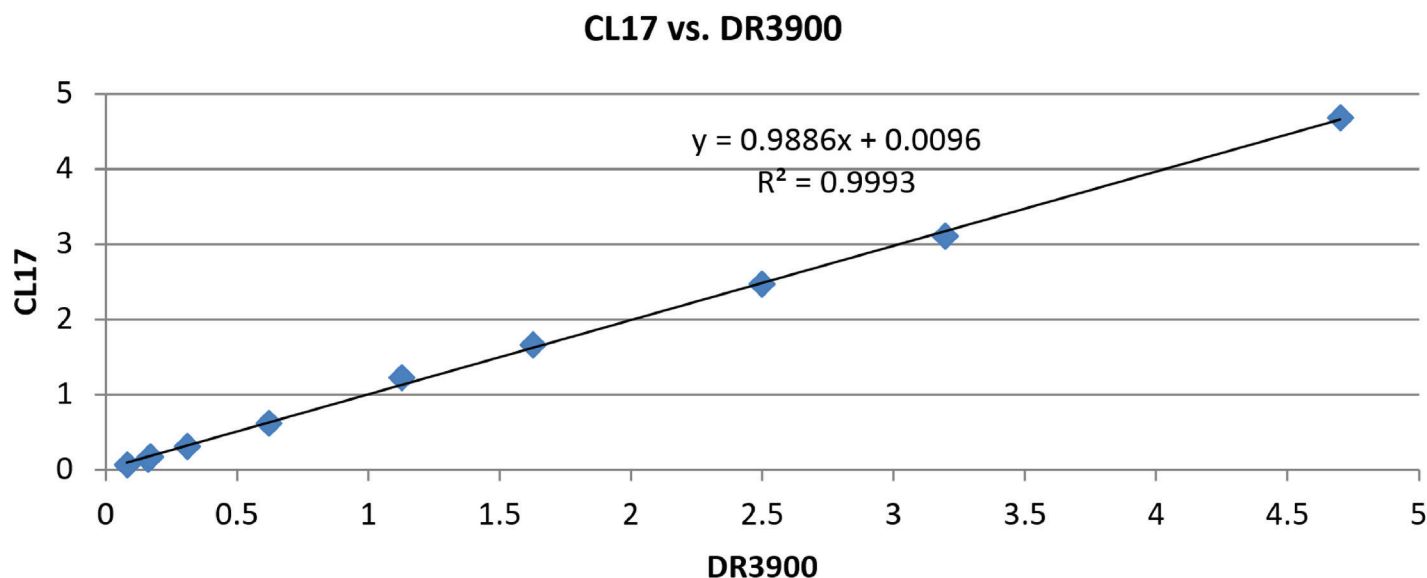


Figure 3 – Inter-Instrument Verification

Procedure

CL17 Prepared Standard Verification

1. Configure the CL17 analyzer as shown in Figure 4. Calibration Kit 5449000 contains all the necessary equipment for this configuration. See the included Instruction Sheet, 5449089, for detailed step-by-step configuration guidelines.
2. Run four replicates of a Zero Standard as described in 5449089.
3. Prepare a Chlorine Standard and calculate the expected concentration.
4. Run four replicates of the Prepared Standard.
5. Sample results are displayed on the analyzer screen.
6. Calculate the Average Concentration, %RSD, and %Difference.

DR3900 Prepared Standard Verification

1. Follow the written procedure in the appropriate method (Free/Total, Low/High Range) using the Prepared Standard as the sample.
2. The measured value will display on the spectrophotometer screen.
3. Sample results are stored in the Data Log.

CL17 Process Sample Verification

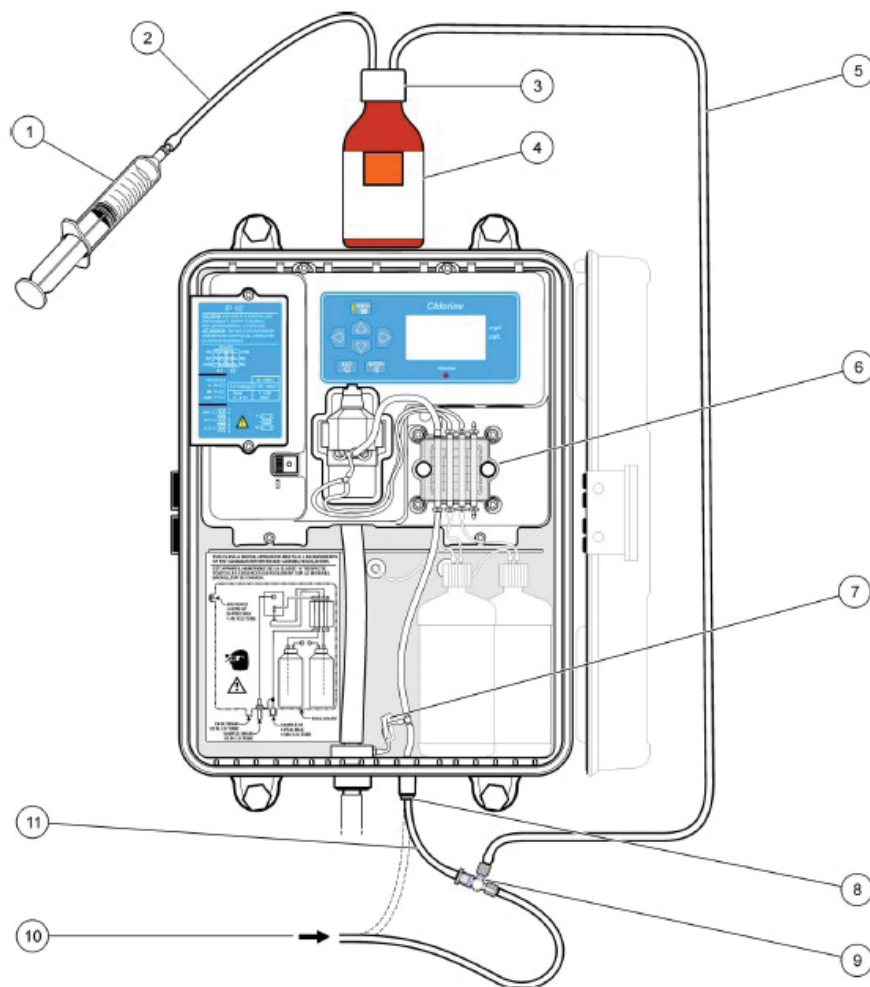
1. Obtain a grab sample from the inlet of the analyzer during a period of steady concentration values. Ensure that the sample container is free of chlorine demand.
2. Rinse the sample container several times with the sample.
3. Use the sample for the DR3900 analysis.
4. The measured value will display on the analyzer screen.

DR3900 Prepared Standard Analysis

1. Follow the written procedure in the appropriate method (Free/Total, Low/High Range) using the Prepared Standard as the sample.
2. The measured value will display on the spectrophotometer screen.
3. Sample results are stored in the Data Log.

APPLICATION: CHLORINE ANALYZER CALIBRATION PROCEDURES

Figure 4 – CL17 Prepared Standard Calibration/Verification Configuration



1. Syringe with check valve
2. Vent line
3. Calibration cap
4. Standard bottle
5. Draw line
6. Pinch Valve
7. Tubing clamp on drain bypass line
8. John-Guest fitting
9. 3-way Luer-lock valve (no sample will flow when valve is in this position)
10. Sample IN line
11. 2-inch piece of tubing

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