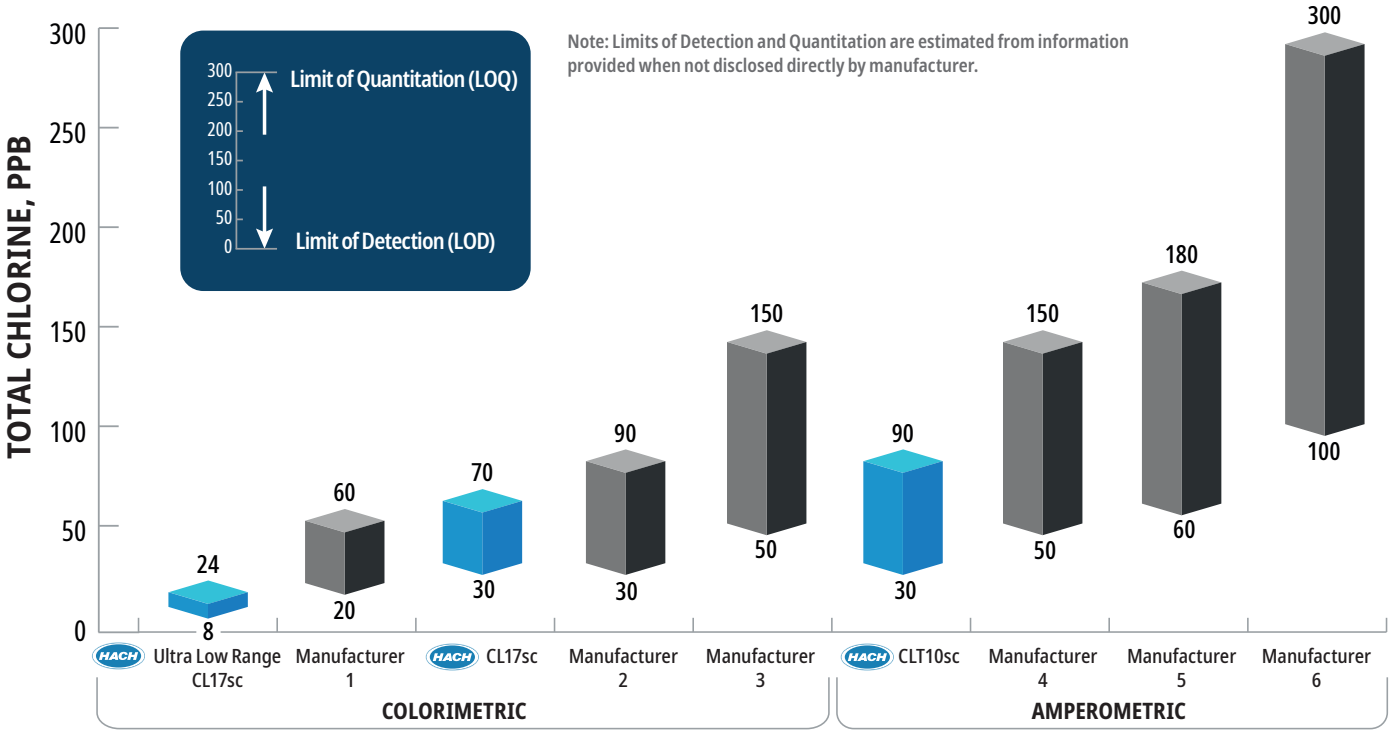
Limits of Detection and Quantitation

Comparison of Ultra Low Range Total Chlorine Residual Limits of Detection and Quantitation Across the Water Industry

Limits of Detection and Quantitation are key to understanding analytical instrumentation capabilities, especially when non-optimal process control can lead to damage of sensitive equipment due to insufficiently accurate readings. Notice how the Hach® Ultra Low Range CL17sc Total Chlorine Analyser, the Hach CL17sc, and the Hach CLT10sc compare in accuracy with competitor analysers.

Process Chlorine Analysers, Limits of Detection and Quantitation in Parts Per Billion



How to Think about Accuracy at Low Ranges

To count the number of credible measurements of a chlorine analyser, we sum the number of measurements below the limit of detection (LOD, indicating the absence of chlorine) and the number of measurements above the limit of quantitation (LOQ). Above the LOQ, the reading of chlorine is accurate as specified in the user manual.

The ULR CL17sc has LOD of 8 µg/L (ppb) and accuracy of ±5 % or 10 ppb, whichever is greater. The CL17sc has LOD of 30 µg/L (ppb), and accuracy of ±5 % or 40 µg/L (ppb), whichever is greater.

Consider the true case of a beverage facility that prepares dechlorinated water (using GAC) for cleaning of equipment for syrup production. **The facility targets total chlorine residual below 35 ppb for process control.** The ULR CL17sc and CL17sc measurements are compared side by side to see if the actionable insights differ.

After two weeks of comparison, **1.3 % of CL17sc measurements were below LOD and above the LOQ**. In other words, 98 % of samples had a definite presence of chlorine (the area between LOD and LOQ) but no statistically quantifiable level –the true value could be 30 ppb (below the target residual) or above 35 ppb.

Conversely, 97 % of the ULR CL17sc measurements were below 8 ppb or greater than 24 ppb meaning that all these results credibly displayed either absence of chlorine below the Limit of Detection or its measurable value above the Limit of Quantitation. Only 2.7 % of readings were between 8 ppb and 34 ppb (8 ppb to 24 ppb ±10 ppb), i.e. where the specified accuracy is inapplicable. The ULR CL17sc showed only 0.3 % of all fully credible readings to be above the 35 ppb target, while there was no such assurance provided by the regular-range analyser. During this side-by-side test, **the ULR CL17sc analyser definitively demonstrated to the customer that the chlorine residual was under control.** The CL17sc could not provide same level of confidence for that residual level.

Depending on your targeted chlorine level, specified LOD yields actionable insights and provides confidence that you are below your residual target. Without such confidence tied to the right specifications, you may be breaching your target, putting your system at risk or incurring additional cost by overfeeding dechlorinating chemicals.

