## Technical Specification

Tests For: Soluble Manganese in Water

Test Range: 0–0.030 mg/L

Reagent Chemistry Used: Leucomalachite green

Method Detection Limit*: 0.001 mg/L

Limit of Quantification**: 0.005 mg/L

*The Method Detection Limit (MDL) is defined as the minimum measured concentration of a substance that can be reported with 99% confidence to be different from the method blank results.[i]

**The Limit of Quantification (LOQ) is the smallest quantity that can be detected with reasonable certainty for a given analytical procedure. [ii]

## Testing for Manganese

Manganese-containing minerals occur widely, and manganese salts are commonly found in many natural waters. Manganese is an objectionable constituent in water used for domestic purposes or industrial applications. In domestic situations, manganese will cause brown or black staining to laundry or plumbing fittings even at very low concentrations. In process applications such as paper manufacturing or textile finishing similar staining can occur. Manganese salts may impart an astringent taste to drinking water supplies, and in swimming pool applications can give an aesthetically displeasing brown coloration to the water.

In most cases where manganese salts occur naturally in the water, it will be necessary to apply special methods of removal before the water can be used for domestic or industrial purposes. The Palintest Manganese test provides an extremely sensitive method of measuring low concentrations of manganese for the assessment of natural waters and the control of manganese removal plant. The test measures total manganese over the range 0–0.030 mg/L.

## Reagent Chemistry

Manganese may occur in water in various valency states. In the first stage of the Palintest method, manganese in lower valency states is oxidised to form permanganate by the action of an oxidising agent. In the second stage the permanganate formed is further reacted with leucomalachite green to form an intense turquoise coloured complex. Catalysts and inhibitors are incorporated into the tablet reagents to ensure that the colour reaction proceeds correctly and interferences are eliminated.

The intensity of colour produced in the test is proportional to the total manganese concentration and is measured using a Palintest Photometer.

## Best Practice Advice for Testing

- Manganese is readily absorbed onto the surfaces of sample containers. To avoid loss of manganese test sample as soon as possible after collection.

- It is important, because of the extreme sensitivity of this test, to ensure that glassware used for the sample collection and test procedure is scrupulously clean. For most accurate results in laboratory use it is recommended that all glassware is acid-rinsed and then thoroughly washed out with deionised water before use.

- Colour formation is extremely sensitive to temperature. The sample temperature should be 20° ± 1°C for optimum test results.

- It is important to observe the standing period of 20 minutes ±1 minute for optimum test results. Any continuing colour development or colour change after this period should be ignored.

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[i] EPA, Definition and Procedure for the Determination of the Method Detection Limit, Revision 2, Dec 2016.
[ii] *IUPAC. Compendium of Chemical Terminology, 2nd ed. (the "Gold Book").*