



# Standard Test Method for Total Cyanide by Segmented Flow Injection Analysis, In-Line Ultraviolet Digestion and Amperometric Detection<sup>1</sup>

This standard is issued under the fixed designation D7511; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This method is used for determining total cyanide in drinking and surface waters, as well as domestic and industrial wastes. Cyanide ion ( $\text{CN}^-$ ), hydrogen cyanide in water ( $\text{HCN(aq)}$ ), and the cyano-complexes of zinc, copper, cadmium, mercury, nickel, silver, and iron may be determined by this method. Cyanide ions from Au(I), Co(III), Pd(II), and Ru(II) complexes are only partially determined.

1.2 The method detection limit (MDL) is 1.0  $\mu\text{g/L}$  cyanide and the minimum level (ML) is 3  $\mu\text{g/L}$ . The applicable range of the method is 3 to 500  $\mu\text{g/L}$  cyanide using a 200- $\mu\text{L}$  sample loop. Extend the range to analyze higher concentrations by sample dilution or changing the sample loop volume.

1.3 This method can be used by analysts experienced with equipment using segmented flow analysis (SFA) and flow injection analysis (FIA) or working under the close supervision of such qualified persons.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific hazard statements are given in [Note 2](#) and [Section 9](#).

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

- [D1129 Terminology Relating to Water](#)
- [D1193 Specification for Reagent Water](#)
- [D2036 Test Methods for Cyanides in Water](#)

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee [D19](#) on Water and is the direct responsibility of Subcommittee [D19.06](#) on Methods for Analysis for Organic Substances in Water.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- [D2777 Practice for Determination of Precision and Bias of Applicable Test Methods of Committee D19 on Water](#)
- [D3370 Practices for Sampling Water from Closed Conduits](#)
- [D3856 Guide for Management Systems in Laboratories Engaged in Analysis of Water](#)
- [D4210 Practice for Intralaboratory Quality Control Procedures and a Discussion on Reporting Low-Level Data \(Withdrawn 2002\)<sup>3</sup>](#)
- [D5847 Practice for Writing Quality Control Specifications for Standard Test Methods for Water Analysis](#)
- [D6696 Guide for Understanding Cyanide Species](#)
- [D7365 Practice for Sampling, Preservation and Mitigating Interferences in Water Samples for Analysis of Cyanide](#)

## 3. Terminology

### 3.1 Definitions:

3.1.1 For definitions of terms used in this test method, refer to Terminology [D1129](#) and Guide [D6696](#).

3.1.2 *total cyanide*—refers to all cyanide-containing compounds in a sample, including free cyanide, WAD cyanide compounds, and strong metal cyanide complexes.

## 4. Summary of Test Method

4.1 Prior to analysis, treat the sample to remove potential interferences (Sections [4](#) and [8](#)). Ultraviolet (UV) digestion releases cyanide from cyanide complexes. Acid addition converts cyanide ion to hydrogen cyanide gas ( $\text{HCN}$ ), which passes under a gas diffusion membrane. The hydrogen cyanide gas diffuses through the membrane into an alkaline receiving solution, where it converts back to cyanide ion. A silver working electrode, silver/silver chloride reference electrode, and platinum/stainless steel counter electrode at an applied potential of zero volt amperometrically monitor the cyanide ion. The current generated is proportional to the cyanide concentration present in the original sample.

4.2 Calibrations and data are processed with the instrument's data acquisition software.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).