



Designation: D4517 – 15 (Reapproved 2023)

Standard Test Method for Low-Level Total Silica in High-Purity Water by Flameless Atomic Absorption Spectroscopy¹

This standard is issued under the fixed designation D4517; 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 (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of total silica in water.

1.2 This test method is applicable in the range from 25 $\mu\text{g/L}$ to 250 $\mu\text{g/L}$ of silica as SiO_2 . Higher concentrations may be determined by decreasing the aliquot volume (see [Note 6](#)). Concentration range should not be extended by dilution.

1.3 This test method determines total silica, and does not distinguish between soluble and insoluble forms.

1.4 This test method was tested on reagent water only. It is the user's responsibility to assure the validity of the test method for waters of other matrices.

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

1.6 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[D859 Test Method for Silica in Water](#)

¹ This test method is under the jurisdiction of ASTM Committee [D19](#) on Water and is the direct responsibility of Subcommittee [D19.03](#) on Sampling Water and Water-Formed Deposits, Analysis of Water for Power Generation and Process Use, On-Line Water Analysis, and Surveillance of Water.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[D1066 Practice for Sampling Steam](#)

[D1129 Terminology Relating to Water](#)

[D1192 Guide for Equipment for Sampling Water and Steam in Closed Conduits](#) (Withdrawn 2003)³

[D1193 Specification for Reagent Water](#)

[D2777 Practice for Determination of Precision and Bias of Applicable Test Methods of Committee D19 on Water](#)

[D3370 Practices for Sampling Water from Flowing Process Streams](#)

[D3919 Practice for Measuring Trace Elements in Water by Graphite Furnace Atomic Absorption Spectrophotometry](#)

[D4453 Practice for Handling of High Purity Water Samples](#)

[D5810 Guide for Spiking into Aqueous Samples](#)

[D5847 Practice for Writing Quality Control Specifications for Standard Test Methods for Water Analysis](#)

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this standard, refer to Terminology [D1129](#).

4. Summary of Test Method

4.1 Total silica is determined using an atomic absorption spectrophotometer in conjunction with a graphite furnace. A sample is placed in a graphite tube, evaporated to dryness, charred, and atomized. Since the graphite furnace uses the sample much more efficiently than flame atomization, the detection of low concentrations of elements in small sample volumes is possible. Finally, the absorption signal during atomization is recorded and compared to standards. A general guide for the application of the graphite furnace is given in Practice [D3919](#). Pretreatment of the graphite tube may be used to enhance the sensitivity and repeatability, or both, of the test.⁴

4.2 Total silica is determined using a freshly ultrasonically treated and shaken aliquot of sample.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Rawa, J. A., and Henn, E. L., "Determination of Trace Silica in Industrial Process Waters by Flameless Atomic Absorption Spectrometry," *Analytical Chemistry*, Vol 51, March 1979.