



Designation: D1193 – 24

Standard Specification for Reagent Water¹

This standard is issued under the fixed designation D1193; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers the required characteristics of waters deemed suitable for use with the standards under the jurisdiction of ASTM International.

1.2 The alphanumeric characters ascribed to water types and grades are specified in the manual, Form and Style for ASTM Standards.² These have been assigned in order of historical precedence and should not be taken as an indication of a progression in water purity.

1.3 Four types of waters have been specified with three additional grades that can be applied to the four types. The grade specifications specifically address contaminants of microbiological origin.

1.4 All applicable ASTM International standards are expected to reference one or more of these reagent water types where reagent water is needed as a component of an analytical measurement process.

1.5 Although these water types and associated grades have been defined specifically for use with ASTM International standards, they may be appropriate for other applications. It is the responsibility of the users of this specification to ensure that the selected water types or grades are suitable for their intended use. Historically, reagent water Types I, II, III, and IV have been linked to specific processes for their production. Starting with the 2018 edition of this specification, these types of waters may be produced with alternate technologies as long as the appropriate constituent specifications are met (including bacteria and endotoxins, if applicable) and that water so produced has been shown to be appropriate for the application where the use of such water is specified.

1.6 Guidance for applications, the preparation, use and monitoring, storage, handling, distribution, testing of these

specified waters, and validation of the water purification system is provided in **Appendix X1** of this specification.

1.7 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.8 *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.*

1.9 *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:*³

- D1129 Terminology Relating to Water
- D1253 Test Method for Residual Chlorine in Water
- D4453 Practice for Handling of High Purity Water Samples
- D4517 Test Method for Low-Level Total Silica in High-Purity Water by Flameless Atomic Absorption Spectroscopy
- D5127 Guide for Ultra-Pure Water Used in the Electronics and Semiconductor Industries
- D5173 Guide for On-Line Monitoring of Total Organic Carbon in Water by Oxidation and Detection of Resulting Carbon Dioxide
- D5196 Guide for Bio-Applications Grade Water
- D5245 Practice for Cleaning Laboratory Glassware, Plasticware, and Equipment Used in Microbiological Analyses
- D5391 Test Method for Electrical Conductivity and Resistivity of a Flowing High Purity Water Sample
- D5464 Test Method for pH Measurement of Water of Low Conductivity

¹ This specification is under the jurisdiction of ASTM Committee D19 on Water and is the responsibility of Subcommittee D19.02 on Quality Systems, Specification, and Statistics.

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² *Form and Style for ASTM Standards*, ASTM International, West Conshohocken, PA 19428, www.astm.org.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- D5542** Test Methods for Trace Anions in High Purity Water by Ion Chromatography
- D5997** Test Method for On-Line Monitoring of Total Carbon, Inorganic Carbon in Water by Ultraviolet, Persulfate Oxidation, and Membrane Conductivity Detection
- D6071** Test Method for Low Level Sodium in High Purity Water by Graphite Furnace Atomic Absorption Spectroscopy
- D6161** Terminology Used for Microfiltration, Ultrafiltration, Nanofiltration, and Reverse Osmosis Membrane Processes
- D7126** Test Method for On-Line Colorimetric Measurement of Silica
- D8516** Test Method for Quantification of Culturable Waterborne Bacteria Using a Defined Culture Medium Coated Plate
- 2.2 *ANSI/AAMI Standard:*⁴
ANSI/AAMI Standard ST108:2023 Water for the processing of medical devices, §8.4.1 Validation plan
- 2.3 *APHA Standard:*⁵
9215 Methods for the Examination of Water and Wastewater. 24th ed., Heterotrophic Plate Count (2022)
- 2.4 *ISO Standard:*⁶
ISO 20395:2013 (E) Biotechnology — Requirements for evaluating the performance of quantification methods for nucleic acid target sequences — qPCR and dPCR
- 2.5 *USP Standards:*⁷
USP <85> Bacterial Endotoxins
USP <1231> Water for Pharmaceutical Purposes

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this standard, refer to Terminology D1129, Terminology D6161, and Appendix X1.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *reagent water, n*—water that is used specifically as a component of an analytical measurement process or for general laboratory use and meets or exceeds the specifications for these waters.

4. Composition and Characteristics

4.1 The types of water described in this specification shall conform to the requirements in Table 1. Water requiring microbial specifications shall conform to the appropriate type and also conform to the grade requirements in Table 2.

5. Test Methods

5.1 *Electrical Conductivity and Resistivity*—Refer to Test Method D5391.

5.2 *pH*—Refer to Test Method D5464.

5.3 *TOC*—Refer to Guide D5173 and Test Method D5997.

5.4 *Sodium*—Refer to Test Method D6071.

5.5 *Chloride*—Refer to Test Methods D5542.

5.6 *Residual Chlorine*—Refer to Test Method D1253.

5.7 *Total Silica*—Refer to Test Methods D4517 and D7126.

5.8 *HBC: Microbiological Contamination*—Refer to Test Method D8516, USP <1231>, and Methods for the Examination of Water and Wastewater. 24th ed., 9215, Heterotrophic Plate Count (2022).

5.9 *Endotoxin*—Refer to USP <85>.

6. Keywords

6.1 analysis; laboratory; reagent; water

TABLE 1 Requirements for Quality of Reagent Water by Type

Type	Conductivity μS/cm ^A (max)	Resistivity MΩ·cm ^B (min)	pH ^C	TOC μg/L ^D (max)	Sodium μg/L ^E (max)	Chloride μg/L ^F (max)	Residual Chlorine μg/L ^G (max)	Total Silica μg/L ^H (max)
I	0.0555	18		50	1	1		3
II	1.0	1.0		50	5	5	50	3
III	0.25	4.0		200	10	10	50	500
IV	5.0	0.2	5.0 to 8.0		50	50	50	

^A Electrical conductivity at 25 °C.

^B Electrical resistivity at 25 °C.

^C pH at 25 °C, not applicable to higher resistivity waters.

^D Total organic carbon, μg/L as C.

^E Sodium, μg/L as sodium.

^F Chloride, μg/L as chloride.

^G Chlorine, μg/L as Cl₂.

^H Total silica, μg/L as SiO₂.