



Designation: D1331 – 20 (Reapproved 2024)

Standard Test Methods for Surface and Interfacial Tension of Solutions of Paints, Solvents, Solutions of Surface-Active Agents, and Related Materials¹

This standard is issued under the fixed designation D1331; 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 These test methods cover the determination of surface tension and interfacial tension of a variety of liquid materials, including but not restricted to paints, solvents, and solutions of surface-active agents, as defined in Terminology [D459](#). Four methods are covered as follows:

- Method A—Surface Tension by du Noüy ring;
- Method B—Interfacial Tension by du Noüy ring;
- Method C—Surface Tension by Wilhelmy plate; and
- Method D—Interfacial Tension by Wilhelmy plate.

1.2 Method A originally was written primarily to cover aqueous solutions of surface-active agents, but is also applicable to aqueous paints, nonaqueous solutions (including paints) and mixed solvent solutions.

1.3 Method B is applicable to two-phase solutions. More than one solute component may be present, including solute components that are not in themselves surface-active.

1.4 Method C is applicable to surface active liquids and, unlike du Noüy ring, no buoyancy corrections are needed and results are not affected by moderate viscosities (1-10 Pa-sec) of the liquid. It is the recommended method for use with paints and resin solutions.

1.5 Method D is applicable to two-phase solutions and mixtures.

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

1.7 *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 These test methods are under the jurisdiction of ASTM Committee [D01](#) on Paint and Related Coatings, Materials, and Applications and are the direct responsibility of Subcommittee [D01.24](#) on Physical Properties of Liquid Paints & Paint Materials.

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Material Safety Data Sheets are available for reagents and materials. Review them for hazards prior to usage.

1.8 *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

- [D459 Terminology Relating to Soaps and Other Detergents](#)
- [E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods](#)
- [E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

- 3.1.1 *du Noüy ring, n*—platinum wire ring.
- 3.1.2 *Wilhelmy plate, n*—flat, thin plate made of glass or platinum.

4. Summary of Test Methods

4.1 *du Noüy Ring Methods*—The ring is suspended from a tensiometer or balance. The test liquid is brought into contact with the ring until the latter is covered. For interfacial tension measurements, the ring must be at the interface between the two liquids. The ring is then slowly withdrawn until a maximum force is attained, from which the surface or interfacial tension may be calculated.

4.2 *Wilhelmy Plate Methods*—The plate is suspended from a tensiometer or balance. The test liquid or interface between two liquids is brought into contact with the bottom of the plate, causing the plate to be pulled down into the liquid by the surface tension force. The force applied to the plate from above

² 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.