



Standard Test Method for Hydrophobic Surface Films by the Water-Break Test¹

This standard is issued under the fixed designation F22; 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 test method covers the detection of the presence of hydrophobic (nonwetting) films on surfaces and the presence of hydrophobic organic materials in processing environments. When properly conducted, the test will enable detection of molecular layers of hydrophobic organic contaminants. On very rough or porous surfaces, the sensitivity of the test may be significantly decreased.

1.2 The values stated in SI units are to be regarded as the standard. The inch-pound values given in parentheses are for information only.

1.3 *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.*

2. Referenced Documents

2.1 ASTM Standards:²

- [C813 Test Method for Hydrophobic Contamination on Glass by Contact Angle Measurement](#)
- [D351 Classification for Natural Muscovite Block Mica and Thins Based on Visual Quality](#)
- [D1193 Specification for Reagent Water](#)
- [D2578 Test Method for Wetting Tension of Polyethylene and Polypropylene Films](#)
- [D5946 Test Method for Corona-Treated Polymer Films Using Water Contact Angle Measurements](#)
- [D7334 Practice for Surface Wettability of Coatings, Substrates and Pigments by Advancing Contact Angle Measurement](#)
- [D7490 Test Method for Measurement of the Surface Tension](#)

¹ This test method is under the jurisdiction of ASTM Committee E21 on Space Simulation and Applications of Space Technology and is the direct responsibility of Subcommittee E21.05 on Contamination.

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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.

[of Solid Coatings, Substrates and Pigments using Contact Angle Measurements](#)

[F21 Test Method for Hydrophobic Surface Films by the Atomizer Test](#)

3. Terminology

3.1 Definitions:

3.1.1 *contact angle, n*—the interior angle that a drop makes between the substrate and a tangent drawn at the intersection between the drop and the substrate as shown in [Fig. 1](#); this is the angle formed by a liquid at the three phase boundary where a liquid, gas (air) and solid intersect.

3.1.2 *hydrophilic*—having a strong affinity for water, wettable.

3.1.2.1 *Discussion*—Hydrophilic surfaces exhibit zero contact angle with water. A sessile drop of water applied to the surface will immediately spread out to form a film.

3.1.3 *hydrophobic*—having little affinity for water, nonwettable.

3.1.3.1 *Discussion*—Hydrophobic surfaces exhibit contact angles between a sessile drop of water and the surface appreciably greater than zero.

3.1.4 *sessile drop*—a drop of liquid sitting on the upper side of a horizontal surface.

3.1.5 *water-break*—a break in the continuity of a film of water on a surface on removal from an aqueous bath or on removal of a flowing water source from the surface.

4. Summary of Test Method

4.1 The water-break test is performed by withdrawing the surface to be tested, in a vertical position, from a container of purified water and observing the behavior of the water. For large parts, the test surface may be doused with water and the water behavior observed on removal of the water source.

4.2 The interpretation of the test is based upon the pattern of wetting. Contaminated areas having a surface tension lower than water will cause the water to bead up at that location or “break” while draining. Most common film contaminants such as oils, silicones, or fluorocarbon greases have surface tensions significantly lower than water. In the absence of hydrophobic films, the draining water layer will remain as a film over the