



Designation: D7236 – 16a (Reapproved 2021)

Standard Test Method for Flash Point by Small Scale Closed Cup Tester (Ramp Method)^{1,2}

This standard is issued under the fixed designation D7236; 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.

INTRODUCTION

This flash point test method is a dynamic test method and depends on a definite rate of temperature increase to control the precision of the test method. The rate of heating may not in all cases give the precision quoted in the test method because of the low thermal conductivity of certain materials. The use of an equilibrium method such as Test Methods **D3828**, Method B improves the prediction of flammability for such materials, as the vapors above the test specimen and the test specimen are closer to thermal equilibrium.

Flash point values are a function of the apparatus design, the condition of the apparatus used, and the operational procedure carried out. Flash point can therefore only be defined in terms of a standard test method, and no general valid correlation can be guaranteed between results obtained by different test methods or with test apparatus different than that specified.

1. Scope

1.1 This test method covers the determination of the flash point of aviation turbine fuel, diesel fuel, kerosine and related products in the temperature range of 40 °C to 135 °C by a small scale closed cup apparatus.

1.2 This test method is only applicable to homogeneous materials that are liquid at or near ambient temperature and at temperatures required to perform the test.

1.3 This test method is not applicable to liquids contaminated by traces of highly volatile materials.

1.4 This test method is a dynamic method and depends on a definite rate of temperature increase. It is one of many flash point methods available, and every flash point test method, including this one, is an empirical one.

1.5 If the user's specification requires a defined flash point method, neither this test nor any other method should be substituted for the prescribed method without obtaining comparative data and an agreement from the specifier.

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.* For specific hazard statements, see Section 7 and the Material Safety Data Sheet for the product being tested.

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:*³

D3828 Test Methods for Flash Point by Small Scale Closed Cup Tester

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

¹ This test method is under the jurisdiction of ASTM Committee **D02** on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee **D02.08** on Volatility.

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² This test method is being jointly developed and harmonized with the Energy Institute.

³ 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.

D6299 Practice for Applying Statistical Quality Assurance and Control Charting Techniques to Evaluate Analytical Measurement System Performance

D6300 Practice for Determination of Precision and Bias Data for Use in Test Methods for Petroleum Products, Liquid Fuels, and Lubricants

E300 Practice for Sampling Industrial Chemicals

2.2 ISO Standards;⁴

ISO Guide 34 General requirements for the competence of reference material producers

ISO Guide 35 Reference materials—General and statistical principles for certification

3. Terminology

3.1 Definitions:

3.1.1 *flash point, n*—in flash point test methods, the lowest temperature of the test specimen, adjusted to account for variations in atmospheric pressure from 101.3 kPa, at which application of an ignition source causes the vapors of the test specimen to ignite under the specified conditions of test.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *dynamic, adj*—the condition where the vapor above the test specimen, and the test cup, are not in temperature equilibrium at the time the test flame is applied.

3.2.2 *ramp method, n*—in flash point methods, method that has a test temperature increase at a set rate.

4. Summary of Test Method

4.1 A $2 \text{ mL} \pm 0.1 \text{ mL}$ test specimen is introduced into the test cup that is then heated automatically at a constant rate of $2 \text{ }^{\circ}\text{C}/\text{min} \pm 0.5 \text{ }^{\circ}\text{C}/\text{min}$. A gas test flame is directed through an opening shutter, in the test cup lid, at specified temperature intervals until a flash is detected by the automatic flash detector. The flash is reported as defined in 3.1.1.

5. Significance and Use

5.1 The flash point temperature is one measure of the tendency of the test specimen to form a flammable mixture with air under controlled laboratory conditions. It is only one of a number of properties that must be considered in assessing the overall flammability hazard of a material.

5.2 Flash point is used in shipping and safety regulations to define *flammable* and *combustible* materials and classify them. Consult the particular regulation involved for precise definitions of these classifications.

5.3 This test method can be used to measure and describe the properties of materials in response to heat and a test flame under controlled laboratory conditions and shall not be used to describe or appraise the fire hazard or fire risk of materials under actual fire conditions. However, results of this test method may be used as elements of a fire risk assessment, that takes into account all of the factors that are pertinent to an assessment of the fire hazard of a particular end use.

6. Apparatus

6.1 *Flash Point Apparatus*—The apparatus consists of an electrically heated test cup that is controlled automatically to give a temperature increase of $2.0 \text{ }^{\circ}\text{C}/\text{min} \pm 0.5 \text{ }^{\circ}\text{C}/\text{min}$, a lid and shutter assembly, a pilot and test flame, an automatic flash detector and a temperature display that displays and holds the test temperature when a flash is detected. The key parts and dimensions are described in **Annex A1** and illustrated in **Fig. A1.1**.

6.2 *Syringe*, 2 mL, adjusted to deliver $2.00 \text{ mL} \pm 0.1 \text{ mL}$.

6.3 *Barometer*, accurate to 0.5 kPa. Barometers pre-corrected to give sea level readings, such as those used at weather stations and airports, shall not be used.

NOTE 1—Automatic barometric correction in accordance with 12.2 may be installed in the apparatus.

6.4 *Cooling Bath or Freezer*, for cooling the samples, if required, and capable of cooling the sample to at least $10 \text{ }^{\circ}\text{C}$ below the expected flash point. If a freezer is used, it shall be of explosion-protected design.

6.5 *Draft Shield*, a shield fitted at the back and on two sides of the instrument, for use in circumstances where natural protection from drafts does not exist.

NOTE 2—A shield 350 mm high, 480 mm wide, and 240 mm deep, is suitable.

7. Reagents and Materials

7.1 *Cleaning Solvent*—Use only noncorrosive solvents capable of cleaning the test cup and lid assembly. Two commonly used solvents are toluene and acetone. (**Warning**—Toluene, acetone and many solvents are flammable and a health hazard. Dispose of solvents and waste material in accordance with local regulations.)

7.2 *Butane or Natural Gas*—For use as the pilot and test flame. (**Warning**—Butane and natural gases are flammable and a health hazard.)

8. Sampling

8.1 Obtain at least a 25 mL sample from a bulk test site in accordance with Practices **D4057**, **D4177**, **E300** or other comparable sampling practices.

8.2 Store samples in clean, tightly sealed containers at normal room temperature ($20 \text{ }^{\circ}\text{C}$ to $25 \text{ }^{\circ}\text{C}$) or colder. Ensure that the container is 85 % to 95 % full.

8.3 Do not store samples for an extended period of time in gas permeable containers, such as plastic, because volatile material may diffuse through the walls of the container. Samples in leaky containers are suspect and not a source of valid results.

8.4 Erroneously high flash points can be obtained when precautions are not taken to avoid loss of volatile materials. Do not open containers unnecessarily. Do not make a transfer unless the sample temperature is at least $10 \text{ }^{\circ}\text{C}$ below the expected flash point. Where possible perform the flash point as the first test on the sample.

8.5 Samples containing dissolved or free water may be dehydrated with calcium chloride. Warming the sample is

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.