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An American National Standard

Standard Test Method for Flash Point by Tag Closed Tester¹

This standard is issued under the fixed designation D 56; 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 test method has been adopted for use by government agencies to replace Method 1101 of Federal Test Method Standard No. 791b, and Method 4291 of Federal Test Method Standard No. 141A.

1. Scope

1.1 This test method covers the determination of the flash point, by Tag closed tester, of liquids with a viscosity of below 5.5 centistokes (cSt) at 104°F (40°C), or below 9.5 cSt at 77°F (25°C), and a flash point below 200°F (93°C) except cut-back asphalts, those liquids which tend to form a surface film under test conditions, and materials which contain suspended solids.

NOTE 1—For the closed-cup flash point of liquids with a viscosity of 5.5 cSt or more at 104°F (40°C), or 9.5 cSt or more at 77°F (25°C), with a flash point of 200°F (93°C) or higher, which tend to form a surface film under test conditions, or suspensions of solids, use Method D 93. For cut-back asphalts refer to Methods D 1310 and D 3143.

NOTE 2—The U. S. Department of Transportation (RSTA)² and U. S. Department of Labor (OSHA) have established that liquids with a flash point under 100°F (37.8°C) are flammable as determined by this method for those liquids which have a viscosity less than 5.5 cSt at 104°F (40°C), or 9.5 cSt or less at 77°F (25°C), or do not contain suspended solids or do not have a tendency to form a surface film while under test. Other classification flash points have been established by these Departments for liquids using this test.

1.2 Liquids having viscosities more than 5.5 cSt at 104°F (40°C), or 9.5 cSt or more at 77°F (25°C), and contain suspended solids or have a tendency to form a surface film while under test should be tested in accordance with Test Methods D 93.

1.3 The values stated in inch-pound units are to be regarded as the standard. Temperatures are in degrees Fahrenheit and viscosity is in Centistokes units. The values in parentheses are for information only.

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

¹ This test method is under the joint jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D 02.08 on Volatility.

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² For information on U. S. Department of Transportation's regulations, see Codes of U. S. Regulations 49 CFR Chapter 1 and for information on U. S. Department of Labor's regulations see Code of U. S. Regulations 29 CFR Chapter XVII. Each of these items are revised annually and may be procured from the Superintendent of Documents, Government Printing Office, Washington, DC 20402.

1.5 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems 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 or regulatory limitations prior to use. For specific hazard statements, see Note 5.*

1.6 Related Standards are Test Methods D 93, D 3828 and D 3941.

2. Referenced Documents

2.1 ASTM Standards:

- D 93 Test Methods for Flash Point by Pensky-Martens Closed Tester³
- D 850 Method for Distillation of Industrial Aromatic Hydrocarbons and Related Materials⁴
- D 1015 Test Method for Freezing Points of High-Purity Hydrocarbons³
- D 1078 Test Method for Distillation Range of Volatile Organic Liquids⁴
- D 1310 Test Method for Flash Point and Fire Points of Liquids by Tag Open-Cup Apparatus³
- D 3143 Test Method for Flash Point of Cutback Asphalt with Tag Open-Cup Apparatus⁵
- D 3828 Test Method for Flash Point by Setaflash Closed Tester⁶
- D 3941 Test Method for Flash Point by the Equilibrium Method with a Closed-Cup Apparatus⁴
- E 1 Specifications for ASTM Thermometers⁷

3. Definition

3.1 *flash point*—the lowest temperature corrected to a pressure of 760 mm Hg (101.3 kPa, 1013 m bar) at which application of a test flame causes the vapors of a portion of the sample to ignite under specified conditions of test.

4. Summary of Test Method

4.1 The sample is placed in the cup of the tester and, with the lid closed, heated at a slow constant rate. A small flame of specified size is directed into the cup at regular intervals. The flash point is taken as the lowest temperature at which application of the test flame causes the vapor above the sample to ignite.

³ Annual Book of ASTM Standards, Vol 05.01.

⁴ Annual Book of ASTM Standards, Vol 06.03.

⁵ Annual Book of ASTM Standards, Vol 04.03.

⁶ Annual Book of ASTM Standards, Vol 05.01.

⁷ Annual Book of ASTM Standards, Vol 05.01 and 14.01.

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5. Significance and Use

5.1 Flash point measures tendency of the sample 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. One should consult the particular regulation involved for precise definitions of these classes.

5.3 Flash point can indicate the possible presence of highly volatile and flammable materials in a relatively nonvolatile or nonflammable material. For example, an abnormally low flash point on a sample of kerosine may indicate gasoline contamination.

6. Apparatus

6.1 *Tag Closed Tester*—The apparatus is shown in Fig. 1 and described in detail in Annex A1. Refer to Annex A2 for

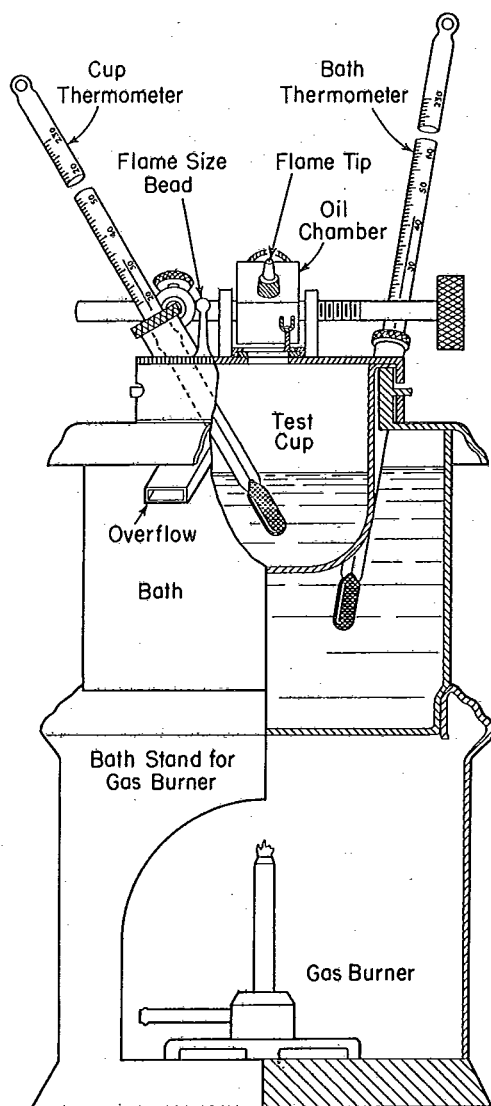


FIG. 1 Tag Closed Flash Tester

directions for checking the condition and operation of the tester.

6.2 *Shield*—A shield 18 in. (460 mm) square and 24 in. (610 mm) high, open in front, is recommended.

6.3 *Thermometers*—For the test cup thermometer, use one as prescribed in Table 1. For the bath thermometer, any convenient type that has an adequately open scale covering the required range may be used; it is often convenient to use the same type of thermometer as used in the test cup.

NOTE 3—Whenever thermometers complying with ASTM requirements are not available, thermometers complying with the requirements for The Institute of Petroleum thermometer IP 15F PM-Low may be used.

NOTE 4—There are automatic flash point testers available and in use which may be advantageous in that they save testing time, permit the use of small samples, and exhibit other factors which may merit their use. When automatic testers are used, the user must be sure that all of the manufacturer's instructions for calibrating, adjusting, and operating the instrument are followed. In any case of dispute, the flash point as determined manually shall be considered the referee test.

7. Sample

7.1 Erroneously high flash points can be obtained when precautions are not taken to avoid the loss of volatile material. Containers shall not be opened unnecessarily and transfers shall not be made unless the sample temperature is at least 20°F (11°C) below the expected flash point. Samples in leaky containers shall be discarded.

7.2 Samples are not to be stored in plastic (polyethylene, polypropylene, etc.) bottles, since volatile material may diffuse through the walls of the bottle.

8. Preparation of Apparatus

8.1 Support the tester on a level steady table. Unless tests are made in a draft-free room or compartment, surround the tester on three sides by the shield for protection from drafts. Tests are not to be made in a laboratory draft hood or near ventilators.

8.2 Gas is recommended for the test flame.

9. Procedure

9.1 For flash points below 55°F (13°C) or above 140°F (60°C), use as bath liquid a 1+1 mixture of water and ethylene glycol (see **Warning**—see Note 5). For flash points between 55°F (13°C) and 140°F (60°C), either water or a water-glycol mixture may be used as bath liquid (Note 5). The temperature of the liquid in the bath shall be at least 20°F (11°C) below the expected flash point at the time of introduction of the sample into the test cup. Do not cool bath liquid by direct contact with dry ice (solid carbon dioxide). Place the test cup in position in the bath.

NOTE 5: **Precaution**—Although ethylene glycol is considered low in oral toxicity, nonirritating to the skin, and appears to be no respiratory hazard during normal handling, caution should be exercised when using

TABLE 1 Thermometers

For Tests	Below 40°F (4°C)	At 40 to 120°F (4 to 49°C)	Above 120°F (49°C)
Use ASTM Thermometer ^A	57F or 57C	9F or 9C 57F or 57C	9F or 9C

^A Complete specifications for these thermometers are given in Specification E 1.