



# Standard Test Method for Discrimination Between Flammability Ratings of $F = 0$ and $F = 1$ <sup>1</sup>

This standard is issued under the fixed designation D 6668; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

## 1. Scope

1.1 This test method covers a means for the discrimination between solid and liquid materials which will not burn in air when exposed to a temperature of 1500°F (815.5°C) for a period of 5 min and those which will ignite and burn under the same conditions.

1.2 This test method may be applied to any substance which is a solid or liquid at ambient temperature and pressure.

1.3 The purpose of this test method is to provide a means for the classification of the flammability hazard of materials of hazard degrees ( $F=0$ ) and ( $F=1$ ) or both, in accordance with the definitions of degrees of flammability hazard as defined by NFPA 704 (par. 3.2.1).

1.4 This test method should be used subject to the limitations that no single fire hazard property such as flash point, ignition temperature, or the performance under the conditions of the present method shall be used to describe or appraise the fire hazard or fire risk of a material, product, assembly or system under actual fire conditions. Fire hazard properties measured under controlled laboratory conditions may, nevertheless, be employed to describe properly the response of materials, products, assemblies or systems under said controlled conditions. Properties measured under controlled laboratory conditions may be used as elements of hazard or risk assessment only when such assessment takes into account all of the factors that are pertinent to the evolution of the fire hazard of a given situation.

1.5 The values stated in inch-pound units shall be regarded as the standard. The SI values given in parenthesis are provided for information only.

1.6 *This standard is used to predict or provide a quantitative measure of the fire hazard from a specified set of fire conditions involving specific materials, products, or assemblies. This assessment does not necessarily predict the hazard of actual fires which involve conditions other than those assumed in the analysis.*

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 and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:

D 235 Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)<sup>2</sup>

### 2.2 NFPA Standards:<sup>3</sup>

NFPA 704 Identification of the Hazards of Materials for Emergency Response

## 3. Terminology

### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *burning, n*—for the purposes of this test method, burning shall be defined to include the presence of any visible flame, sparks or glowing embers when the sample is exposed to 1500°F (815.5°C) for 5 min under the conditions of the test method. Charring without visible evidence of flame, sparks, or glowing embers shall not be considered to constitute burning.

3.1.2 *flammability hazard degree one ( $F=1$ ), n*—materials that will burn in air when exposed to a temperature of 1500°F (815.5°C) for 5 min under the conditions of this test method or which, by reason of their flash point, fire point, autoignition temperature, or sustained combustibility, would be rated as *Hazard Degree One* regardless of their performance in this test method.

3.1.3 *flammability hazard degree zero ( $F=0$ ), n*—materials that will not burn in air when exposed to a temperature of 1500°F (815.5°C) for 5 min under the conditions of this test method provided that they do not exhibit properties including flash point, fire point, autoignition, or sustained combustibility which might cause them to be rated or classified as a more hazardous material (that is,  $F=1$  or higher).

## 4. Summary of Test Method

4.1 Small, measured amounts of the sample are placed on a stainless steel surface heated to 1500°F (815.5°C). Reactions

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 06.04.

<sup>3</sup> Available from National Fire Protection Assoc., 1 Batterymarch Park, Quincy, MA 02269-9101.

which occur during the 5 min interval, thereafter, are observed and recorded.

**5. Significance and Use**

5.1 A material which does not exhibit any evidence of burning as defined herein under the conditions of the test procedure may be classified as *Flammability Degree of Hazard Zero* material ( $F=0$ ) provided other properties of the material are not such as to require a higher degree of classification.

**6. Test Specimen**

6.1 *Liquid Sample*—30 mL is sufficient for the performance of this test method.

6.2 *Solid Specimens*—30 g are sufficient for the performance of this test method.

**7. Apparatus**

7.1 *Flask Heater*, 750 W with transformer control heater, stepless, repeatable  $\pm 0.6$  W.<sup>4</sup>

7.2 *Temperature Readout Device*, any potentiometric or electronic device capable of reading the temperature of a chromel alumel thermocouple within  $\pm 1^\circ\text{F}$  ( $0.6^\circ\text{C}$ ).

7.3 *Chromel-Alumel Thermocouple*, 24 gage, welded to center of stainless steel planchet.

7.4 *Stainless Steel Planchet*, 26 gage, 50 mm diameter  $\times$  12.7 mm deep.

7.5 *Borosilicate Chimney*, 70 mm O.D.  $\times$  230 mm high mounted over planchet with 2.5 mm air gap between bottom of chimney and top of planchet holder surface.

7.6 *Planchet Holder*, ceramic composite capable of withstanding  $1500^\circ\text{F}$  ( $815.5^\circ\text{C}$ ), 127 mm  $\times$  127 mm thick with 54 mm centrally located hole to hold planchet.

7.7 *Ceramic Cord*, approximately 0.8 mm diameter to be wrapped around planchet, if needed, to hold it firmly in place in the planchet holder.

7.8 *Hypodermic Syringe*, 0.5 mL with 450 mm 26 gage needle. TFE-fluorcarbon tipped plunger is preferred.

7.9 *Assembled Test Apparatus*, see Fig. 1.

**8. Materials**

8.1 *Mineral Spirits*, Specification D 235, Type 1.

8.2 *Steel Wool*.

8.3 *Absorbent Tissue*.

**9. Procedure**

9.1 Rinse interior of planchet with mineral spirits, wipe dry with absorbent tissue.

9.2 Set the control transformer to bring the interior surface of the planchet to  $1500^\circ\text{F}$ . Adjust the transformer setting until the surface temperature remains at  $1500 \pm 10^\circ\text{F}$  ( $815.5 \pm 6^\circ\text{C}$ ).

<sup>4</sup> The sole source of supply of the apparatus known to the committee at this time is the Precision Scientific Co., Model No. 61600, 750 W, 120 VAC with transformer heat control. If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,<sup>1</sup> which you may attend.

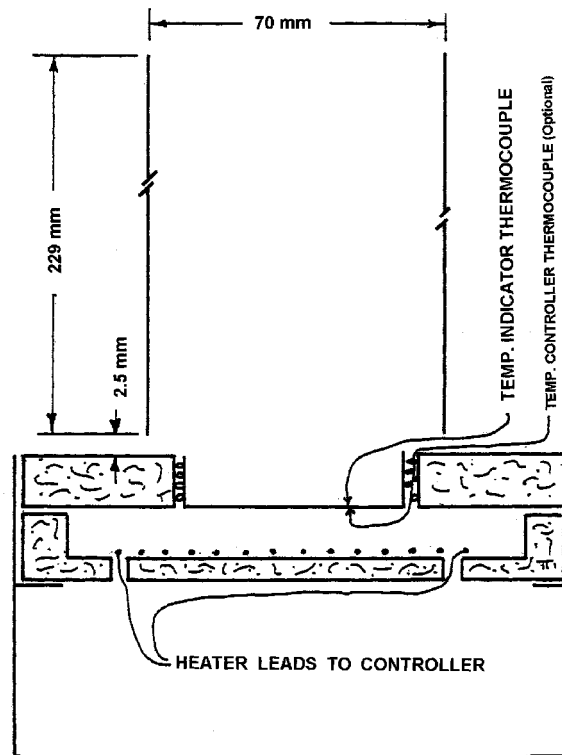


FIG. 1 Assembled Test Apparatus

9.3 *Liquid Samples*—Introduce a 0.1 mL specimen on to the heated planchet surface and observe for evidence of burning as defined in 3.1.1. If no burning is observed, repeat for 0.2 mL, 0.5 mL, and 1.0 mL specimens, as required, to establish whether burning occurs. If burning is observed for any specimen size, further investigation with larger specimens is not required.

9.4 *Solid Specimens*—Introduce a 0.1 g specimen on to the heated planchet surface and observe for evidence of burning as defined by 3.1.1. If no burning is observed, repeat for 0.2, 0.5, and 1.0 g specimens, as required, to establish whether burning occurs. If burning is observed for any specimen size, further investigation with larger specimens is not required.

9.5 A complete test for either liquid or solid specimens shall include duplication of 9.1, 9.2, 9.3, or 9.4, or a combination thereof, as may be required to confirm initial findings.

NOTE 1—This procedure may be conducted at individual temperatures lower than 1500°F (815.5°C) or at a series of lower temperatures to determine the threshold for burning. Any such variations in test procedure shall be reported.

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## 10. Report

10.1 Report whether or not burning as defined in 3.1.1 occurs at the test temperature.

10.2 If no burning occurs, report that the *Flammability Hazard Rating* of the sample is zero ( $F=0$ ) provided that no conflicting properties of the sample require a higher rating.

10.3 If burning occurs, report that the *Flammability Hazard Rating* of the sample is one ( $F=1$ ) provided that no conflicting properties of the sample require a higher rating.

## 11. Precision and Bias

11.1 No information is presented about either precision or bias of Test Method D 6668 for measuring flammability ratings since the test result is nonquantitative.

## 12. Keywords

12.1 burning; flammability hazards; flammability rating