



Designation: D6194 – 14

## Standard Test Method for Glow-Wire Ignition of Materials<sup>1</sup>

This standard is issued under the fixed designation D6194; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope\*

1.1 This test method covers the minimum temperature required to ignite insulating materials using a glowing heat source. In a preliminary fashion, this test method differentiates between the susceptibilities of different materials with respect to their resistance to ignition due to an electrically-heated source.

1.2 This test method applies to molded or sheet materials available in thicknesses ranging from 0.25 to 6.4 mm.

1.3 This test method is not valid for determining the ignition behavior of complete electrotechnical equipment, since the design of the electrotechnical product influences the heat transfer between adjacent parts.

1.4 This test method measures and describes the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire hazard or fire risk assessment of the materials, products, or assemblies under actual fire conditions.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard. (See [IEEE/ASTM SI-10](#) for further details.)

1.6 *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. For specific precautionary statements, see Section 9.*

1.7 *Fire testing is inherently hazardous. Adequate safeguards for personnel and property shall be employed in conducting these tests.*

NOTE 1—Although this test method and IEC 60695-2-13 differ in approach and in detail, data obtained using either are technically equivalent.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D09 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.17 on Fire and Thermal Properties.

Current edition approved Nov. 1, 2014. Published November 2014. Originally approved in 1997. Last previous edition approved in 2010 as D6194 – 10. DOI: 10.1520/D6194-14.

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

- D1711 Terminology Relating to Electrical Insulation
- E176 Terminology of Fire Standards
- E220 Test Method for Calibration of Thermocouples By Comparison Techniques
- E230 Specification and Temperature-Electromotive Force (EMF) Tables for Standardized Thermocouples
- IEEE/ASTM SI-10 International System of Units (SI), The Modernized Metric System

#### 2.2 IEC Standard:

- IEC 60695-4 Fire Hazard Testing—Part 4: Terminology Concerning Fire Tests<sup>3</sup>
- IEC 60695-2-12 Fire Hazard Testing—Part 2-12: Glowing/Hot-Wire Based Test Methods—Glow-Wire Flammability Test Method for Materials<sup>3</sup>
- IEC 60695-2-13 Fire Hazard Testing—Section 20: Glowing/Hot-Wire Based Test Methods—Glow-Wire Coil Ignitability Test Method for Materials<sup>3</sup>

#### 2.3 ISO Standard:<sup>4</sup>

- ISO 13943 Fire Safety—Vocabulary

### 3. Terminology

3.1 *Definitions*—Use Terminology E176, ISO 13943, and IEC 60695-4 for definitions of terms used in this test method and associated with fire issues. Where differences exist in definitions, those contained in Terminology E176 shall be used. Use Terminology D1711 for definitions of terms used in this test method and associated with electrical insulation materials.

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

3.2.1 *glow-wire, n*—a wire of specified dimensions that can be controllably heated electrically to determine ignitability of a material.

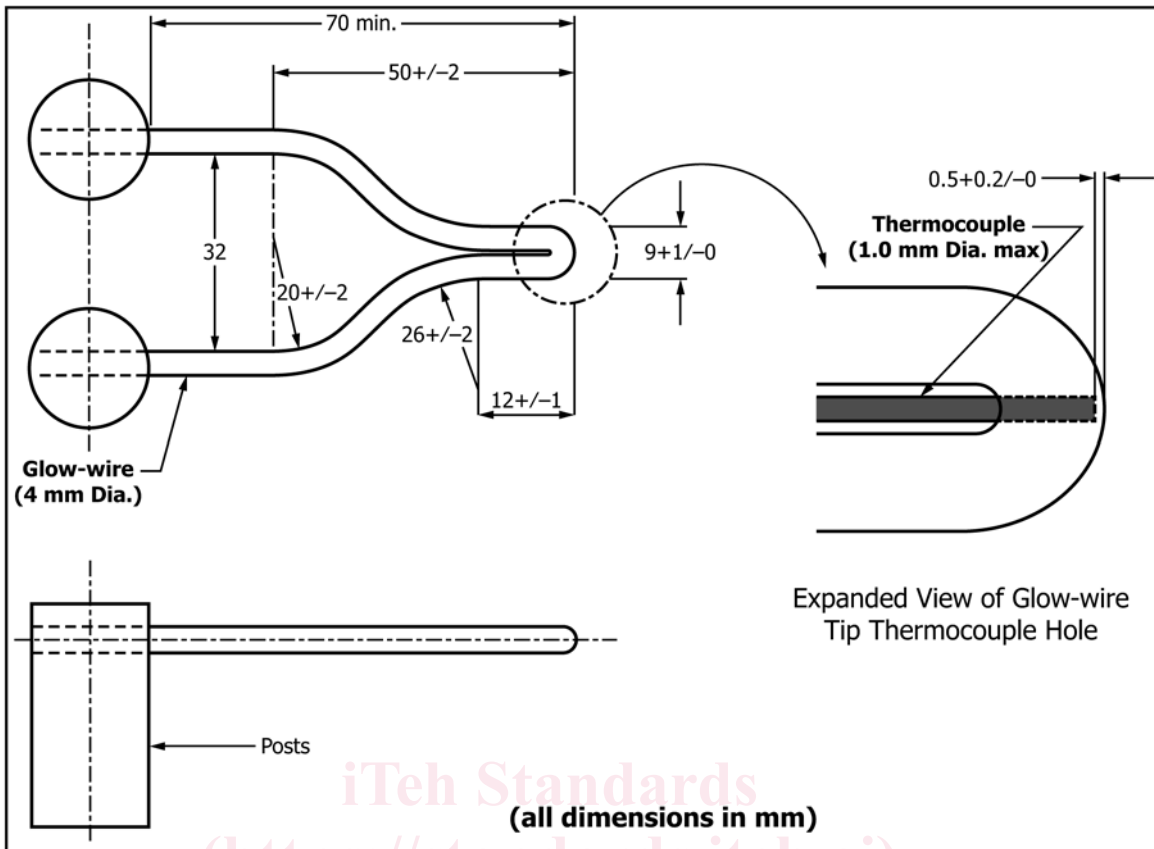
3.2.1.1 *Discussion*—Fig. 1 shows a glow-wire and its positioning.

<sup>2</sup> 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.

<sup>3</sup> Available from International Electrotechnical Commission (IEC), 3 Rue de Varembe, Case postale 131, CH-1211, Geneva 20, Switzerland, http://www.iec.ch.

<sup>4</sup> Use undyed, soft, strong, lightweight tissue paper weighing between 12 and 30 g/m<sup>2</sup>.

\*A Summary of Changes section appears at the end of this standard



NOTE 1—All dimensions in millimetres.

FIG. 1 Glow-Wire and Positioning of Thermocouple

3.2.2 *glow-wire flammability index (GWFI), n*—the highest test temperature, during three subsequent tests for a test specimen of a given thickness, at which one of the following conditions are fulfilled: a) flames or glowing of the test specimen extinguish within 30 s after removal of the glow-wire and there is no ignition of the wrapping tissue placed underneath the test specimen; b) there is no ignition of the test specimen.

3.2.3 *glow-wire ignition temperature (GWIT), n*—the temperature which is 25°C (30°C between 900 and 960°C) higher than the GWFI.

3.2.4 *ignition, n*—initiation of combustion.

3.2.4.1 *Discussion*—Ignition is deemed to have taken place when the first of the following occurs: sustained flaming on the test specimen surface for over 5 s, or falling particles causing the appearance of flames on a tissue paper placed underneath the test specimen.

#### 4. Summary of Test Method

4.1 In this test method, a standardized test specimen (either square or round), is supported vertically and is exposed to electrical heating from a glow-wire set at pre-determined temperatures. The minimum temperature for glow-wire ignition is assessed through testing at incremental temperatures.

#### 5. Significance and Use

5.1 During operation of electrical equipment, including wires, resistors, and other conductors, it is possible for overheating to occur under certain conditions of operation, or when malfunctions occur. When this happens, a possible result is ignition of the adjacent insulation material.

5.2 This test method assesses the susceptibility of electrical insulating materials to ignition as a result of exposure to a glowing wire.

5.3 This test method determines the minimum temperature required to ignite a material by the effect of a glowing heat source, under the specified conditions of test.

5.4 This method is suitable, subject to the appropriate limitations of an expected precision of  $\pm 15\%$ , to categorize materials.

5.5 In this procedure, the specimens are subjected to one or more specific sets of laboratory conditions. If different test conditions are substituted or the end-use conditions are changed, it is not always possible by or from this test to predict changes in the fire-test-response characteristics measured. Therefore, the results are valid only for the fire test exposure conditions described in this procedure.