



Standard Test Method for Determining the Arc Thermal Performance Value of Materials for Clothing¹

This standard is issued under the fixed designation F 1959/F 1959M; 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.

1. Scope

1.1 This test method is used to measure the arc thermal performance value of materials intended for use as flame resistant clothing for workers exposed to electric arcs that would generate heat flux rates from 2 to 600 cal/cm²s.

1.2 This test method will measure the arc thermal performance value of materials which meet the following requirements: less than 6 in. char length and less than 2 s afterflame when tested in accordance with Federal Test Method 191A Method 5903.1.

1.2.1 It is not the intent of this procedure to evaluate non flame resistant materials except where used as under layers in multiple layer specimens.

1.3 The materials used in this test method are in the form of flat specimens.

1.4 This test method may be used to generate information for the development of smaller scale test methods.

1.5 This standard shall be used to measure and describe the properties of materials, products, or assemblies in response to convective and radiant energy generated by an electric arc under controlled laboratory conditions.

1.6 The values stated in either SI units or in other units shall be regarded separately as standard. The values stated in each system may not be exact equivalents, therefore each system must be used independently of the other, without combining values in any way.

1.7 *This standard shall 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 a fire assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.*

1.8 *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 precautions, see Section 7.*

2. Referenced Documents

2.1 ASTM Standards:

D 123 Terminology Relating to Textiles²

D 4391 Terminology Relating to the Burning Behavior of Textiles³

F 1494 Terminology Relating to Protective Clothing⁴

2.2 ANSI/IEEE Standard:⁵

Standard Dictionary of Electrical and Electronics Terms

2.3 Federal Standard:⁶

Federal Test Method Standard (FTMS) No. 191A Method 5903.1, Flame Resistance Cloth Vertical

3. Terminology

3.1 Definitions:

3.1.1 See also Terminology D 4391.

3.1.2 *arc duration, n*—time duration of the arc, s.

3.1.3 *arc energy, vi dt, n*—sum of the instantaneous arc voltage values multiplied by the instantaneous arc current values multiplied by the incremental time values during the arc, J.

3.1.4 *arc gap, n*—distance between the arc electrodes, in.

3.1.5 *arc thermal performance value (ATPV), n*—in arc testing, the incident energy on a fabric or material that results in sufficient heat transfer through the fabric or material to cause the onset of a second-degree burn based on the Stoll curve.

3.1.6 *arc voltage, n*—voltage across the gap caused by the current flowing through the resistance created by the arc gap, V.

3.1.7 *asymmetrical arc current, n*—the total arc current produced during closure; it includes a direct component and a symmetrical component, A.

3.1.8 *blowout, n*—the extinguishing of the arc caused by a magnetic field.

3.1.9 *closure, n*—point on supply current wave form where arc is initiated.

3.1.10 *breakopen, n*—in electric arc testing, a material response evidenced by the formation of one or more holes in

² Annual Book of ASTM Standards, Vol 07.01.

³ Annual Book of ASTM Standards, Vol 07.02.

⁴ Annual Book of ASTM Standards, Vol 11.03.

⁵ Available from the Institute of Electrical and Electronics Engineers, Inc., 345 E. 47th St., New York, NY 10017.

⁶ Available from Standardization Documents Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

¹ This test method is under the jurisdiction of ASTM Committee F-18 on Electrical Protective Equipment for Workers and is the direct responsibility of Subcommittee F18.65 on Wearing Apparel.

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