



Standard Test Method for Concentration Limits of Flammability of Chemicals (Vapors and Gases)¹

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1. Scope

1.1 This test method covers the determination of the lower and upper concentration limits of flammability of chemicals having sufficient vapor pressure to form flammable mixtures in air at one atmosphere pressure at the test temperature. This test method may be used to determine these limits in the presence of inert dilution gases. No oxidant stronger than air should be used. Care must be used when working with compounds containing oxygen. For chemicals that may be difficult to ignite such as certain amines, halogenated materials, etc., refer to Annex A1.

NOTE 1—The lower flammability limit and upper flammability limit are also referred to as the lower explosive limit (LEL) and the upper explosive limit (UEL), respectively.

1.2 This test method is limited to an initial pressure of 101 kPa (1 atm) or less, with a practical lower pressure limit of approximately 13.3 kPa (100 mm Hg). The maximum practical operating temperature of this equipment is approximately 150°C (302°F).

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are provided for information only.

1.4 This test method 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 method may be used as elements of a fire risk assessment that takes into account all of the factors pertinent to an assessment of the fire hazard of a particular end use.

1.5 This standard may involve hazardous materials, operations, and equipment. *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.* Specific precautionary statements are given in Section 8

2. Referenced Documents

2.1 ASTM Standards:

- E 171 Specification for Standard Atmospheres for Conditioning and Testing Flexible Barrier Materials²
- E 582 Test Method for Minimum Ignition Energy and Quenching Distance in Gaseous Mixtures
- E 1445 Terminology Relating to Hazardous Potential of Chemicals
- E 1515 Test Method for Minimum Explosible Concentration of Combustible Dusts³

3. Terminology

3.1 Definitions:

3.1.1 *lower limit of flammability or lower flammable limit (LFL)*—the minimum concentration of a combustible substance that is capable of propagating a flame in a homogeneous mixture of the combustible and a gaseous oxidizer under the specified conditions of test.

3.1.2 *propagation of flame—as used in this test method*, the upward and outward movement of the flame front from the ignition source to the vessel walls or at least to within 13 mm (½ in.) of the wall, which is determined by visual observation. By outward, it is meant a flame front that has a horizontal component to the movement away from the ignition source.

3.1.3 *upper limit of flammability or upper flammable limit (UFL)*—the maximum concentration of a combustible substance that is capable of propagating a flame in a homogeneous mixture of the combustible and a gaseous oxidizer under the specified conditions of test.

4. Summary of Test Method

4.1 A uniform mixture of a gas or vapor with air is ignited in a closed vessel, and the upward and outward propagation of the flame away from the ignition source is noted by visual observation. The concentration of the flammable component is varied between trials until the composition that will just sustain propagation of the flame is determined.

5. Significance and Use

5.1 The LFL and UFL of gases and vapors define the range of flammable concentrations in air.

¹ This test method is under the jurisdiction of ASTM Committee E-27 on Hazard Potential of Chemicals and is the direct responsibility of Subcommittee E27.04 on Flammability and Ignitability of Chemicals.

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² Annual Book of ASTM Standards, Vol 15.09.

³ Annual Book of ASTM Standards, Vol 14.02.