



Standard Test Method for Limiting Oxygen (Oxidant) Concentration of Combustible Dust Clouds¹

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1. Scope

1.1 This test method is designed to determine the limiting oxygen concentration of a combustible dust dispersed in a mixture of air with an inert/nonflammable gas in a near-spherical closed vessel of 20 L or greater volume.

1.2 Data obtained from this method provide a relative measure of the deflagration characteristics of dust clouds.

1.3 This test method should be used to measure and describe the properties of materials 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 a fire risk assessment that takes into account all of the factors that are pertinent to an assessment of the fire hazard of a particular end use.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *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:*²

D3173 Test Method for Moisture in the Analysis Sample of Coal and Coke

D3175 Test Method for Volatile Matter in the Analysis Sample of Coal and Coke

¹ This test method is under the jurisdiction of ASTM Committee E27 on Hazard Potential of Chemicals and is the direct responsibility of Subcommittee E27.05 on Explosibility and Ignitability of Dust Clouds.

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² 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.

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E1226 Test Method for Explosibility of Dust Clouds

E1515 Test Method for Minimum Explosible Concentration of Combustible Dusts

E2079 Test Methods for Limiting Oxygen (Oxidant) Concentration in Gases and Vapors

2.2 *NFPA Publications:*³

NFPA 69 Standard on Explosion Prevention Systems

2.3 *CEN/CENELEC Publications:*⁴

EN 14034-4 Determination of the explosion characteristics of dust clouds—Part 4: Determination of the limiting oxygen concentration LOC of dust clouds

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *dust concentration*—the mass of dust divided by the internal volume of the test chamber.

3.1.2 *limit of flammability*—the boundary in composition space dividing flammable and nonflammable regions.

3.1.3 *limiting oxygen (oxidant) concentration (LOC) of a fuel-oxidant-inert system*—the oxygen (oxidant) concentration at the limit of flammability for the worst case (most flammable) fuel concentration.

3.1.3.1 *Discussion*—The Limiting Oxygen (oxidant) Concentration is sometimes also known as *Minimum Oxygen (oxidant) Concentration* or as *Critical Oxygen (oxidant) Concentration*.

3.1.4 P_{ignition} —the absolute pressure at the time the ignitor is activated, see Fig. 1.

3.1.5 $\Delta P_{\text{ignitor}}$ —the pressure rise in the chamber due to the ignitor by itself in air at atmospheric pressure.

3.1.6 $P_{\text{ex,a}}$ —the maximum explosion pressure (absolute) reached during the course of a single deflagration test.

³ Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, <http://www.nfpa.org>.

⁴ Available from European Committee for Standardization (CEN), Avenue Marnix 17, B-1000, Brussels, Belgium, <http://www.cen.eu>.