



Standard Test Method for Pressure and Rate of Pressure Rise for Combustible Dusts¹

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^{ε1} NOTE—Paragraph 9.1 was editorially corrected July 2003.

INTRODUCTION

The primary objective for the laboratory determination of the dust deflagration index, K_{St} , the maximum pressure, P_{max} , and the maximum rate of pressure rise, $(dP/dt)_{max}$, is the use of these values for the design of protection systems. These parameters provide a measure of the potential severity of a deflagration of a combustible dust-air mixture. These parameters are a function of many factors, such as the turbulence, concentration, and homogeneity of the dust-air mixture; the type, energy, and location of the ignition source; the geometry of the test vessel; the particle size distribution of the dust; and the initial temperature and pressure of the tested mixture. Therefore, it is necessary to develop a standard laboratory test method, the data from which can be referenced against data from large-scale testing. For information on the sizing of deflagration vents, see NFPA 68.

This test method describes procedures for explosibility testing of dusts in laboratory chambers that have volumes of 20 L or greater. It is the purpose of this test method to provide information that can be used to predict the effects of an industrial scale deflagration of a dust-air mixture without requiring large-scale tests.

1. Scope

1.1 This test method is designed to determine the deflagration parameters of a combustible dust-air mixture within a near-spherical closed vessel of 20 L or greater volume. The parameters measured are the maximum pressure and the maximum rate of pressure rise.

1.2 Data obtained from this test method provide a relative measure of deflagration characteristics. The data have also been shown to be applicable to the design of protective measures, such as deflagration venting (1).²

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.

NOTE 1—The evaluation of the deflagration parameters of maximum pressure and maximum rate of pressure rise can also be done using a 1.2-L Hartmann Apparatus. Test Method E 789, has been published regarding this application; however, the use of these data in the design of deflagration venting and containment systems is not recommended.

1.4 *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 3173 Test Method for Moisture in the Analysis Sample of Coal and Coke
- D 3175 Test Method for Volatile Matter in the Analysis Sample of Coal and Coke
- E 789 Test Method for Pressure and Rate of Pressure Rise for Dust Explosions in a 1.2-Litre Closed Cylindrical Vessel
- E 1515 Test Method for Minimum Explosible Concentration of Combustible Dusts

2.2 NFPA Publication:

- NFPA 68 Guide for Deflagration Venting³

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 E27.05 on Dusts.

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² The boldface numbers in parentheses refer to a list of references at the end of this test method.

³ Available from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.