



Standard Test Method for Autoignition Temperature of Chemicals¹

This standard is issued under the fixed designation E659; 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.

INTRODUCTION

This test method is one of several methods developed by ASTM Committee E27 for determining the hazards of chemicals. It is designed to be used in conjunction with other tests to characterize the hazard potential of the chemical under test.

1. Scope

1.1 This test method covers the determination of hot- and cool-flame autoignition temperatures of a liquid chemical in air at atmospheric pressure in a uniformly heated vessel.

NOTE 1—Within certain limitations, this test method can also be used to determine the autoignition temperature of solid chemicals which readily melt and vaporize at temperatures below the test temperature and for chemicals that are gaseous at atmospheric pressure and temperature.

NOTE 2—After a round robin study, Test Method D2155 was discontinued, and replaced by Test Method E659 in 1978. See also Appendix X2.

1.2 *This standard 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 may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.*

2. Referenced Documents

2.1 ASTM Standards:²

D2155 Test Method for Determination of Fire Resistance of Aircraft Hydraulic Fluids by Autoignition Temperature

D2883 Test Method for Reaction Threshold Temperature of Liquid and Solid Materials

E659 Test Method for Autoignition Temperature of Liquid Chemicals

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

Current edition approved Sept. 1, 2015. Published September 2015. Originally approved in 1978. Last previous edition approved in 2014 as E659 – 14. DOI: 10.1520/E0659-15.

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.

3. Terminology

3.1 Definitions:

3.1.1 *ignition, n*—the initiation of combustion.

3.1.1.1 *Discussion*—Ignition, which is subjective, is defined for this test method as the appearance of a flame accompanied by a sharp rise in the temperature of the gas mixture. The determination is made in total darkness because some flames, such as cool-flames, are observed with difficulty.

3.1.2 *autoignition, n*—the ignition of a material commonly in air as the result of heat liberation due to an exothermic oxidation reaction in the absence of an external ignition source such as a spark or flame.

3.1.3 *autoignition temperature, n*—the minimum temperature at which autoignition occurs under the specified conditions of test.

3.1.3.1 *Discussion*—Autoignition temperature is also referred to as spontaneous ignition temperature, self-ignition temperature, autogenous ignition temperature, and by the acronyms AIT and SIT. As determined by this test method, AIT is the lowest temperature at which the substance will produce hot-flame ignition in air at atmospheric pressure without the aid of an external energy source such as spark or flame. It is the lowest temperature to which a combustible mixture must be raised, so that the rate of heat evolved by the exothermic oxidation reaction will over-balance the rate at which heat is lost to the surroundings and cause ignition.

3.1.4 *cool-flame, n*—a faint, pale blue luminescence or flame occurring below the autoignition temperature (AIT).

3.1.4.1 *Discussion*—Cool-flames occur in rich vapor-air mixtures of most hydrocarbons and oxygenated hydrocarbons. They are the first part of the multistage ignition process.

3.1.5 *ignition delay time, n*—the time lapse between application of heat to a material and its ignition. It is the time in seconds between insertion of the sample into the flask and ignition. It is maximum at the minimum autoignition temperature and also referred to as ignition lag.