



Standard Test Method for Luminometer Numbers of Aviation Turbine Fuels¹

This standard is issued under the fixed designation D 1740; 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.

This test method has been adopted for use by government agencies to replace Method 2108 of Federal Test Method Standard No. 791b.

1. Scope

1.1 This test method² covers the measurement of the flame radiation characteristics of aviation turbine fuels and other similar distillate fuels expressed in terms of luminometer numbers. There is good correlation between smoke point (Test Method D 1322) and luminometer number which is presented in Appendix X1.²

1.2 *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 precautionary statements, see 7.1, 7.2, 8.1, 8.2 and Annex A1.1.*

NOTE 1—It is the intent of Subcommittee J to ballot to withdraw this test method when due for reapproval in 2006, because of very limited and declining use to determine compliance with aviation turbine fuel specifications.

2. Referenced Documents

2.1 ASTM Standards:

- D 1322 Test Method for Smoke Point of Aviation Turbine Fuels³
- D 1655 Specification for Aviation Turbine Fuels³
- D 2880 Specification for Gas Turbine Fuel Oils³

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *luminometer number*—a measure of flame temperature at a fixed flame radiation in the green-yellow band of the visible spectrum.

3.1.1.1 *Discussion*—It can be correlated with combustion characteristics of fuels for use in current commercial aviation turbine engines.

4. Summary of Test Method

4.1 The luminometer number of a fuel is determined by burning the fuel in the ASTM-CRC Luminometer lamp and obtaining a curve of flame radiation, as measured by an optical filter and photo cell unit against the temperature rise across the burner measured by a thermocouple placed just above the flame. This temperature rise is compared with that obtained on a pair of reference fuels at a constant radiation level. To ensure that the constant rating level is the same in all units, it is defined as the smoke point of tetralin. Luminometer number is calculated from the difference in temperature rise between the test fuel and the temperature rise for tetralin divided by the difference in temperature rise for isooctane and tetralin.

5. Significance and Use

5.1 This test method provides an indication of the relative radiation emitted by the combustion products of gas turbine fuels from a diffusion flame. The radiation level, expressed as luminometer number, is related to the hydrocarbon type composition of such fuels. A high luminometer number indicates a fuel of low radiation characteristics.

5.2 The luminometer number (and the smoke point with which it can be correlated) is qualitatively related to the potential radiant heat transfer from the combustion products of the fuel. Because radiant heat transfer exerts a strong influence on the metal temperature of combustor liners and other hot section parts of gas turbines, the luminometer number provides a basis for correlation of fuel characteristics with the life of these components.

6. Apparatus

6.1 *ASTM-CRC Luminometer*,⁴ shown schematically in Fig. 1, consisting of three main parts:

6.1.1 A small wick-type lamp in which the sample is burned,

6.1.2 An optical filter and photocell circuit which indicates the intensity of flame radiation in the range from 4800 to 7000 Å and

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.J0 on Aviation Fuels.

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² This test method was developed on the basis of cooperative work carried out by the Coordinating Research Council and published in CRC Report "Evaluation of CRC Luminometer" (CRC Project No. CA-16-58). June 1959.

³ *Annual Book of ASTM Standards*, Vol 05.01.

⁴ The ASTM-CRC Luminometer, made by ERDCO Engineering Corp., 721 Custer Ave., P. O. Box 1310, Evanston, IL 60204 has been used to develop the precision of Test Method D 1740.