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Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester[1]

This standard is issued under the fixed designation D93; 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 standard has been approved for use by agencies of the U.S. Department of Defense.

INTRODUCTION

This flash point test method is a dynamic test method which depends on specified rates of heating to be able to meet the precision of the test method. The rate of heating may not in all cases give the precision quoted in the test method because of the low thermal conductivity of some materials. There are flash point test methods with slower heating rates available, such as Test Method D3941 (for paints, resins, and related products, and high viscosity products in the range of 0 °C to 110 °C), where the test conditions are closer to equilibrium.

Flash point values are a function of the apparatus design, the condition of the apparatus used, and the operational procedure carried out. Flash point can therefore only be defined in terms of a standard test method, and no general valid correlation can be guaranteed between results obtained by different test methods, or with test apparatus different from that specified.

1. Scope*

1.1 These test methods cover the determination of the flash point of petroleum products in the temperature range from 40 °C to 370 °C by a manual Pensky-Martens closed-cup apparatus or an automated Pensky-Martens closed-cup apparatus, and the determination of the flash point of biodiesel in the temperature range of 60 °C to 190 °C by an automated Pensky-Martens closed cup apparatus.

NOTE 1—Flash point determinations above 250 °C can be performed, however, the precision has not been determined above this temperature. For residual fuels, precision has not been determined for flash points above 100 °C. The precision of in-use lubricating oils has not been determined. Some specifications state a D93 minimum flash point below 40 °C, however, the precision has not been determined below this temperature.

1.2 Procedure A is applicable to distillate fuels (diesel, biodiesel blends, kerosine, heating oil, turbine fuels), new and in-use lubricating oils, and other homogeneous petroleum liquids not included in the scope of Procedure B or Procedure C.

1.3 Procedure B is applicable to residual fuel oils, cutback residua, used lubricating oils, mixtures of petroleum liquids with solids, petroleum liquids that tend to form a surface film under test conditions, or are petroleum liquids of such kinematic viscosity that they are not uniformly heated under the stirring and heating conditions of Procedure A.

1.4 Procedure C is applicable to biodiesel (B100). Since a flash point of residual alcohol in biodiesel is difficult to observe by manual flash point techniques, automated apparatus with electronic flash point detection have been found suitable.

1.5 These test methods are applicable for the detection of contamination of relatively nonvolatile or nonflammable materials with volatile or flammable materials.

1.6 The values stated in SI units are to be regarded as the standard.

1.6.1 *Exception*—The values given in parentheses are for information only.

NOTE 2—It has been common practice in flash point standards for many decades to alternately use a C-scale or an F-scale thermometer for temperature measurement. Although the scales are close in increments, they are not equivalent. Because the F-scale thermometer used in this procedure is graduated in 5 °F increments, it is not possible to read it to the 2 °C equivalent increment of 3.6 °F. Therefore, for the purposes of application of the procedure of the test method for the separate temperature scale thermometers, different increments must be used. In this test method, the following protocol has been adopted: When a temperature is intended to be a converted equivalent, it will appear in parentheses following the SI unit, for example 370 °C (698 °F). When a temperature

[1] These test methods are under the joint jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and are the direct responsibility of Subcommittee D02.08 on Volatility. In the IP, these test methods are under the jurisdiction of the Standardization Committee.

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***A Summary of Changes section appears at the end of this standard**

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