



Standard Test Method for Cloud Point of Petroleum Products (Optical Detection Stepped Cooling Method)¹

This standard is issued under the fixed designation D 5771; 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 describes an alternative procedure for the determination of cloud point of petroleum products Test Method D 2500 using an automatic apparatus. The temperature results from this test method have been found to be equivalent to Test Method D 2500. When specification requires Test Method D 2500, do not substitute this test method or any other method without obtaining comparative data and agreement from the specifier.

1. Scope

1.1 This test method describes the determination of the cloud point of petroleum products that are transparent in layers 40 mm in thickness, by an automatic instrument using an optical device.

1.2 This test method covers the range of temperatures from -40 to $+49^{\circ}\text{C}$ with temperature resolution of 0.1°C .

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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 2500 Test Method for Cloud Point of Petroleum Products²

D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products³

D 4177 Practice for Automatic Sampling of Petroleum and Petroleum Products³

2.2 IP Standard:⁴

IP219 Test Method for Cloud Point of Petroleum Products⁴

2.3 Other Standard:⁵

IEC 751 Industrial Platinum Resistance Thermometer Sensors

3. Terminology

3.1 Definition:

3.1.1 *cloud point, n*—in petroleum products, the temperature of a liquid specimen, when a wax crystal structure, that is similar in appearance to a cloud, is formed upon cooling under prescribed conditions.

3.1.1.1 *Discussion*—The cloud point appears when the temperature of the specimen is low enough to cause wax crystals to precipitate. In homogeneous liquids, the cloud is always noted first at the location in the specimen where the specimen temperature is the lowest. This is typically at the lower portion of the test jar when using the apparatus described in Test Method D 2500.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *automatic cloud point, n*—the temperature of a specimen when the appearance of the cloud is determined under the conditions of this test method.

3.2.1.1 *Discussion*—The cloud point in this test method is determined by an automatic instrument using an optical device for detection of the crystal formation. The apparatus and the conditions are different from those established for Test Method D 2500, although, according to interlaboratory examination the results have been determined to be equivalent to Test Method D 2500.

3.2.2 *D 2500/IP219 equivalent cloud point, n*—the temperature of a specimen, in integers, calculated by rounding the results of this test method to the next lower integer.

3.2.2.1 *Discussion*—This test method produces results with 0.1°C resolution. Should the user wish to provide results with

¹ This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.07 on Flow Properties.

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² *Annual Book of ASTM Standards*, Vol 05.01.

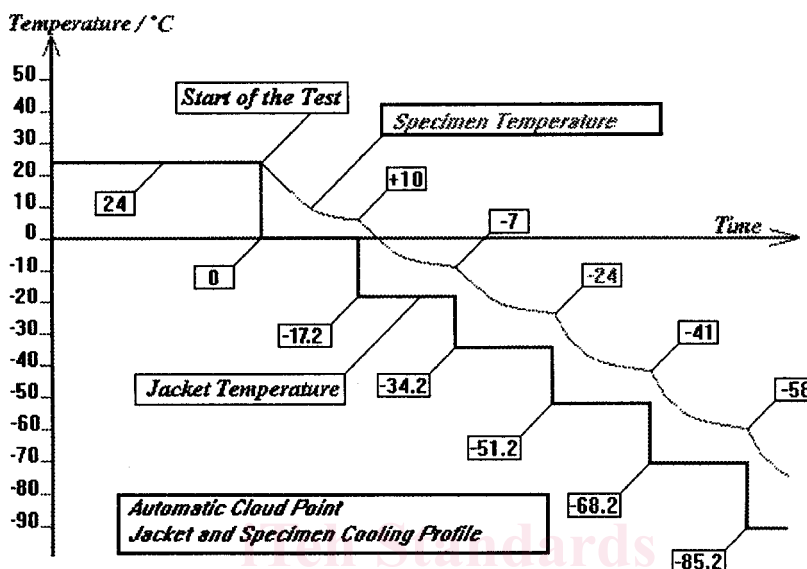
³ *Annual Book of ASTM Standards*, Vol 05.06.

⁴ IP standards are available from the Institute of Petroleum, 61 New Cavendish St., London, England W1M 8AR.

⁵ Available from International Electrotechnical Commission, P.O. 131, 3 Rue de Varembé, CH-Geneve 1211-2.0.

TABLE 1 Jacket and Specimen Cooling Temperatures

Specimen Temperature, °C	Jacket Temperature, °C
ST > + 10	0 ± 0.5
+ 10 ≥ ST > - 7	-17.2 ± 0.5
-7 ≥ ST > - 24	-34.2 ± 0.5
-24 ≥ ST > - 41	-51.2 ± 0.5
-41 ≥ ST > - 58	-68.2 ± 0.5
-58 ≥ ST > - 75	-85.2 ± 0.5



a similar format to Test Method D 2500, then this calculation can be performed. Some apparatus can perform this calculation automatically.

4. Summary of Test Method

4.1 After insertion of the specimen into the apparatus, and the initiation of the program, the specimen is cooled according to the cooling profile listed in Table 1. The specimen is continuously monitored by an optical system for the formation of a crystalline structure. When the crystallization of the wax in the specimen is detected by the optical system, the temperature is recorded to within 0.1°C resolution. The specimen is then heated to facilitate the start of the next test.

5. Significance and Use

5.1 The cloud point of a petroleum product is an index of the lowest temperature of its utility for certain applications. Wax crystals of sufficient quantity can plug filters used in some fuel systems.

5.2 Petroleum blending operations require precise measurement of the cloud point.

5.3 This test method can determine the temperature of the test specimen at which wax crystals have formed sufficiently to be observed as a cloud with a resolution of 0.1°C.

5.4 This test method provides results that, when rounded to the next lower integer, are equivalent to Test Method D 2500. Refer to 12.2.

5.5 This test method is more precise than Test Method D 2500.

NOTE 1—According to interlaboratory examination, the reproducibility

of this test method has been found to be more precise than Test Method D 2500.

6. Apparatus

6.1 *Optical Cloud Point Apparatus*⁶—The automated cloud point apparatus (see Fig. 1) described in this test method consists of a microprocessor controller that is capable of controlling one or more independent test cells. The apparatus shall include provisions for independently controlling the temperature of each cell according to the specified cooling profile, continuously monitoring the specimen temperature, detecting the appearance of the cloud point at the bottom of the test jar without removing it from the jacket, and displaying the 0.1 or 1.0°C result (see Fig. 2 and Fig. 3).

6.2 *Temperature Probe, IEC 751 Class A:* $\Delta T = \pm(0.15 + 0.002 ||T||)$, capable of measurement from -50 to +80°C. The temperature probe shall be in contact with the bottom of the test jar.

6.3 *Test Jar*, clear cylindrical glass, mirrored flat bottom, 34 ± 0.1-mm outside diameter, 31 ± 0.3-mm inside diameter, 120 ± 0.5-mm height, thickness of the bottom 2.0 ± 0.5 mm, marked with a line to indicate the sample height 54 ± 0.5 mm above the inside bottom.

6.4 *Jacket*, brass, cylindrical, flat bottom, 113 ± 0.2 mm in depth, 45 ± 0.1-mm inside diameter. It must be cooled according to the cooling profile specified.

⁶ The following instrument has been found suitable for use in this test method: ISL Model CPP97-6 and CPP97-2 available from ISL North America, Stevensville, MD or ISL SA, BP 40, 14790 Verson, France.