



Designation: D1500—12 D1500 – 12 (Reapproved 2017)



Designation: 196/97

Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)¹

This standard is issued under the fixed designation D1500; 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.

1. Scope*~~Scope~~

1.1 This test method covers the visual determination of the color of a wide variety of petroleum products, such as lubricating oils, heating oils, diesel fuel oils, and petroleum waxes.

NOTE 1—Test Method **D156** is applicable to refined products that have an ASTM color lighter than 0.5.

1.2 This test method reports results specific to the test method and recorded as “ASTM Color.”

1.3 *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~~ safety, health, and ~~health~~ environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D156 Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method)

D938 Test Method for Congealing Point of Petroleum Waxes, Including Petrolatum

D2500 Test Method for Cloud Point of Petroleum Products and Liquid Fuels

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

3. Summary of Test Method

3.1 Using a standard light source, a liquid sample is placed in the test container and compared with colored glass disks ranging in value from 0.5 to 8.0. When an exact match is not found and the sample color falls between two standard colors, the higher of the two colors is reported.

4. Significance and Use

4.1 Determination of the color of petroleum products is used mainly for manufacturing control purposes and is an important quality characteristic, since color is readily observed by the user of the product. In some cases, the color may serve as an indication of the degree of refinement of the material. When the color range of a particular product is known, a variation outside the established range may indicate possible contamination with another product. However, color is not always a reliable guide to product quality and should not be used indiscriminately in product specifications.

5. Apparatus

5.1 *Colorimeter*, consisting of light source, glass color standards, sample container housing with cover, and viewing piece as listed in **Annex A1**.

¹ This test method is under the jurisdiction of ASTM Committee **D02** on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee **D02.05** on Properties of Fuels, Petroleum Coke and Carbon Material.

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This is also a standard of Energy Institute issued under the fixed designation IP 196. The final number indicates the year of last revision. This test method was adopted as a joint ASTM-IP standard in 1966. In the IP, this test method is under the jurisdiction of the Standardization Committee.

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.

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

5.2 *Sample Container*—For referee work, use the glass sample jar as shown in Fig. 1. For routine tests, it is permissible to use a cylindrical, clear glass jar with a flat bottom of 30 to 32.4 mm internal diameter, 115 to 125 mm ~~30 mm to 32.4 mm internal diameter~~, 115 mm to 125 mm in external height, and a wall thickness no greater than ~~1.6 mm~~ 1.6 mm as specified in Test Method D2500, or an ordinary 125-mL 125 mL oil sample bottle if it meets these requirements.

5.3 *Ultrasonic Bath, Unheated (optional)*—of suitable dimensions to hold container(s) placed inside of bath, for use in effectively dissipating and removing air or gas bubbles that can be entrained in viscous sample types prior to analysis.

6. Sampling

6.1 Samples shall be taken in accordance with the instructions in Practice D4057.

6.2 For some sample types, such as viscous lube oils that are prone to having entrained air or gas bubbles present in the sample, the use of an ultrasonic bath (see 5.3) without the heater turned on (if so equipped), has been found effective in dissipating bubbles typically within 10 min.

7. Diluent

7.1 *Solvent Kerosine*—*Kerosene*—(Warning—Combustible. Vapor harmful.) Having a color lighter than +21 Saybolt color by Test Method D156, this material is used for diluting dark samples for the test. As an alternative, other solvents, such as white oil or solvent neutral 100 of satisfactory purity that meet the color requirements specified here in 7.1, are also acceptable.

NOTE 2—Solvent ~~kerosine~~ *kerosene* complies with this requirement if it is lighter in color than potassium dichromate ($K_2Cr_2O_7$) solution formed by dissolving ~~4.8 mg~~ 4.8 mg of pure anhydrous $K_2Cr_2O_7$ in ~~1 L~~ 1 L of distilled water.

8. Preparation of Sample

8.1 *Liquid Petroleum Products such as Lubricating Oils*—Fill the sample container to a depth of 50 mm or more and observe the color. When the sample is not clear, heat it just sufficiently enough to make it clear to perform the color measurement at that temperature. A sample heated to a temperature of $6^\circ C$ ($10^\circ F$) ~~6 °C (10 °F)~~ above its cloud point (see Test Method D2500) has been found suitable to test samples using this test method. When the sample is darker than 8 color, one may either stop the test and report “D8 ASTM Color” (see 10.2) or continue the test and mix 15 volumes of sample into ~~85 volumes~~ 85 volumes of solvent ~~kerosine~~ *kerosene* or alternative material (see 7.1) and observe the color of the mixture.

8.2 *Petroleum Waxes, Including Petrolatum*—Heat the sample just sufficiently enough to make it fluid and clear to perform the color measurement at that temperature without heating the wax excessively, because oxidation can occur, along with consequent discoloration of the test specimen. A sample heated to a temperature of $11^\circ C$ to $17^\circ C$ ($20^\circ F$ to $30^\circ F$) ~~11 °C to 17 °C (20 °F to 30 °F)~~ above its congealing point, as determined in accordance with Test Method D938, has been found suitable to test samples using this test method. When the sample is darker than 8 color, one may either stop the test and report “D8 ASTM Color” (see 10.2) or continue the test and mix 15 volumes of melted sample with 85 volumes of solvent ~~kerosine~~ *kerosene* or alternative material (see 7.1) brought to the same temperature and test the mixture at that temperature.

9. Procedure

9.1 Place a sample container or containers, filled to a depth of at least 50 mm ~~50 mm~~ with distilled or deionized water, in the compartment or compartments of the colorimeter through which the standard glasses will be observed. Place the sample in its container in the other compartment. (When using a three-field comparator, this will be the middle compartment.) Cover the containers to exclude all exterior light.

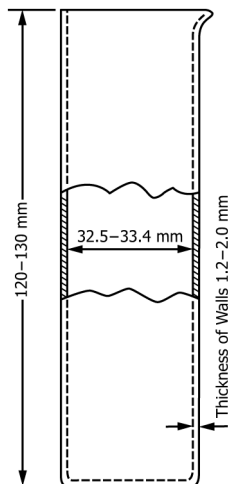


FIG. 1 Standard Glass Sample Jar

9.2 Switch on the light source and compare the color of the sample with that of the standard glasses. When using a three-field comparator, the sample must be bracketed by darker and lighter discs or by an exact match and a darker disc. Determine for two-field comparators which glass matches the color of the sample; or if an exact match is not possible, then use that glass which possesses the next darker color.

10. Report

10.1 Report as the color of the sample, the designation of the glass producing a matching color (for example; “7.5 ASTM Color.”)

10.2 If the color of the sample is intermediate between those of two standard glasses, report that the sample is less than the darker glass designation. As an example, report the designation of the darker glass preceded by the letter “L” (for example, “L7.5 ASTM Color”) or with a “<” symbol (for example, “<7.5 ASTM Color”). Never report the color as being darker than a given standard except those darker than 8 (for example, “D8 ASTM Color” or “>8 ASTM Color.”)

10.2.1 If the color of the sample is less than the 0.5 glass color standard, report that the sample is less than the 0.5 glass color standard. As an example, report the designation as “L0.5 ASTM Color” or “<0.5 ASTM Color.”

10.3 If the sample has been diluted in accordance with 7.1, report the color of the mixture followed by the abbreviation “Dil” (for example, “L7.5 Dil ASTM Color” or “<7.5 Dil ASTM Color”). See **Note 3**.

NOTE 3—For samples that are diluted in 10.3, it is permissible for the laboratory to annotate the report in any suitable manner, provided that the information clearly conveys to the data recipient that the sample analyzed was diluted.

11. Precision and Bias³

11.1 *Precision*—The precision of this test method as obtained by statistical examination of interlaboratory test results is as follows:

11.1.1 *Repeatability*—The difference between successive test results obtained by the same operator with the same apparatus under constant operating conditions on identical test material would, in the long run, in the normal and correct operation of the test method, exceed the following value only in one case in twenty: 0.5 color units.

11.1.2 *Reproducibility*—The difference between two single and independent test results obtained by different operators working in different laboratories on identical test material would, in the long run, in the normal and correct operation of the test method exceed the following value only in one case in twenty: 1 color unit.

11.2 *Bias*—The procedure in this test method has no bias because the value of ASTM Color is subjective and can only be defined in terms of this test method.

12. Keywords

12.1 ASTM Color; color; petroleum products

ANNEX

(Mandatory Information)

A1. DESCRIPTION OF COLORIMETER AND ASSOCIATED APPARATUS

A1.1 *Colorimeter*—Use an instrument that will illuminate and permit observation of the sample and any one of the color standards (or in the case of a three-field instrument, any two of the color standards) simultaneously, either by direct viewing or with an optical eyepiece.

A1.1.1 A two-field instrument must show two illuminated areas of equal size and shape, one filled with light transmitted by color standard, the other with light transmitted by the sample. These illuminated areas shall be disposed symmetrically about a vertical median line and shall be separated in a horizontal direction so that the horizontal separation of the closest portions subtends the eye of the observer not less than 2° nor more than 3.6°.

A1.1.2 A three-field instrument shall show three illuminated areas in the field of view. Two areas shall be filled with light transmitted by two different color standards, and these shall be disposed symmetrically about the third area which shall be filled with light transmitted by the sample. The rectangular dimensions of each of the three areas shall be the same, and the left- and

³ Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D02-1234.