



Designation: D156 – 23

Standard Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method)¹

This standard is issued under the fixed designation D156; 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*

1.1 This test method covers the determination of the color of refined oils such as undyed motor and aviation gasoline, jet propulsion fuels, naphthas and kerosine, and, in addition, petroleum waxes and pharmaceutical white oils.

NOTE 1—For determining the color of petroleum products darker than Saybolt Color – 16, see Test Method [D1500](#).

1.2 This test method reports results specific to this test method and recorded as, “Saybolt Color units.”

1.3 The values stated in inch-pound units or in SI units and which are not in parentheses are to be regarded as the standard. The values given in parentheses are for information only.

NOTE 2—Oil tubes and apparatus used in this test method have traditionally been marked in inches, (the tube is required to be etched with $\frac{1}{8}$ in. divisions.) The Saybolt Color Numbers are aligned with inch, $\frac{1}{2}$ in., $\frac{1}{4}$ in., and $\frac{1}{8}$ in. changes in the depth of oil. These fractional inch changes do not readily correspond to SI equivalents and in view of the preponderance of apparatus already in use and marked in inches, the inch/pound unit is regarded as the standard. However the test method does use SI units of length when the length is not directly related to divisions on the oil tube and Saybolt Color Numbers. The test method uses SI units for temperature.

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

1.5 *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.*

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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2. Referenced Documents

2.1 ASTM Standards:²

[D938](#) Test Method for Congealing Point of Petroleum Waxes, Including Petrolatum

[D1500](#) Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)

[D4057](#) Practice for Manual Sampling of Petroleum and Petroleum Products

[D4175](#) Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

[E308](#) Practice for Computing the Colors of Objects by Using the CIE System

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this test method, refer to Terminology [D4175](#).

3.1.2 *clear-and-bright, n*—condition in which the sample is free of haze or cloudiness. (Also termed *clean-and-bright*.)

3.1.3 *free water, n*—water in excess of that soluble in the sample and appearing in the sample as a haze or cloudiness, as droplets, or as a separated phase or layer.

3.1.4 *particulates, n*—small solid or semisolid particles, sometimes referred to as silt or sediment, that can be suspended in the sample or can settle to the bottom.

3.1.5 *turbidity, n*—reduction of transparency of a sample due to the presence of particulate matter or water haze, or both.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *Saybolt color, n*—an empirical definition of the color of a clear petroleum liquid based on a scale of –16 (darkest) to +30 (lightest).

3.2.1.1 *Discussion*—The number is derived by finding the height of a column of the sample that, when viewed through

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

TABLE 1 Saybolt Colors Corresponding to Depths of Oil

Number of Color Standards	Depth of Oil, in. (mm)	Color Number	Number of Color Standards	Depth of Oil, in. (mm)	Color Number
One-half	20.00 (508)	+30	Two	6.00 (152)	+6
One-half	18.00 (457)	+29	Two	5.75 (146)	+5
One-half	16.00 (406)	+28	Two	5.50 (139)	+4
One-half	14.00 (355)	+27	Two	5.25 (133)	+3
One-half	12.00 (304)	+26	Two	5.00 (127)	+2
One	20.00 (508)	+25	Two	4.75 (120)	+1
One	18.00 (457)	+24	Two	4.50 (114)	0
One	16.00 (406)	+23	Two	4.25 (107)	-1
One	14.00 (355)	+22	Two	4.00 (101)	-2
One	12.00 (304)	+21	Two	3.75 (95)	-3
One	10.75 (273)	+20	Two	3.625 (92)	-4
One	9.50 (241)	+19	Two	3.50 (88)	-5
One	8.25 (209)	+18	Two	3.375 (85)	-6
One	7.25 (184)	+17	Two	3.25 (82)	-7
One	6.25 (158)	+16	Two	3.125 (79)	-8
Two	10.50 (266)	+15	Two	3.00 (76)	-9
Two	9.75 (247)	+14	Two	2.875 (73)	-10
Two	9.00 (228)	+13	Two	2.75 (69)	-11
Two	8.25 (209)	+12	Two	2.625 (66)	-12
Two	7.75 (196)	+11	Two	2.50 (63)	-13
Two	7.25 (184)	+10	Two	2.375 (60)	-14
Two	6.75 (171)	+9	Two	2.25 (57)	-15
Two	6.50 (165)	+8	Two	2.125 (53)	-16
Two	6.25 (158)	+7			

the length of the column, visually matches the appropriate one of three glass standards and referring to **Table 1** of Test Method D156.

4. Summary of Test Method

4.1 The height of a column of sample is decreased by levels corresponding to color numbers until the color of the sample is unmistakably lighter than that of the standard. The color number above this level is reported, regardless of whether the sample was darker, questionable, or a match at the higher level.

5. Significance and Use

5.1 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 can 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.

6. Apparatus

6.1 The Saybolt chromometer consisting of sample and standard tubes, optical system, light source, and color standards, is described in detail in **Annex A1** and illustrated in **Fig. A1.1**.

7. Standardization of Apparatus

7.1 Remove the glass disk from the bottom of the oil tube. Clean the disk, oil tube, and plain tube. When deposits are not removable by wiping or solvent rinsing, wash with soap and water. After cleaning, rinse with distilled or deionized water

and with acetone or some other suitable solvent, and dry. Assemble the oil tube, and position the tubes in the instrument.

7.2 Using the specified light source and illumination, observe the comparative light intensity of the two halves of the optical field, with both tubes empty, and with the 12 mm diaphragm removed from under the plain tube. The intensity of light observed in each half of the optical field must be the same. Adjustment in the position of the light source may be necessary to achieve this match.

NOTE 3—On some instruments, removal of the 12 mm diaphragm can prevent the assembly from seating against the base (about a ¼ in. gap), which can let a lot of stray light in that may affect the light intensity when trying to compare the two halves of the optical field in 7.2. If this occurs, follow the procedure in 7.3 (where the 12 mm diaphragm has been reattached) as the basis to ensure the light source has been properly set to provide the same light intensity in both halves of the optical field.

7.3 Replace the 12 mm diaphragm under the plain tube, and fill the oil tube to the 20 in. (508 mm) mark with distilled or deionized water. The intensity of the light observed in each half of the optical field must be the same, for the instrument to be judged satisfactory for use. The optical properties of glass, from different batches, can vary significantly and it is recommended that only matched tubes, such as described in the Appendix, be used in this test. When a tube is broken, replace both tubes with a matched pair of tubes.

8. Sampling

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

9. Preparation of Test Specimen

9.1 *Samples (Excluding Waxes)*—If the sample is contained in a clear, transparent container, such as glass bottle, visually inspect the sample for evidence of free water, particulate contamination, and haze by holding the container up to the