



Standard Test Method for Saybolt Color of Petroleum Products¹(Saybolt Chromometer Method)

This standard is issued under the fixed designation D 156; 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 4246 of Federal Test Method Standard No. 791b, and Method 101 of Federal Test Method Standard No. 141A.

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 D 1500.

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

2. Referenced Documents

2.1 ASTM Standards:

D 938 Test Method for Congealing Point of Petroleum Waxes, Including Petrolatum²

D 1500 Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)²

D 4057 Practice for Manual Sampling of Petroleum and

Petroleum Products³

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *Saybolt color*—an empirical definition of the color of a clear petroleum liquid based on a scale of – 16 (darkest) to + 30 (lightest). The number is derived by finding the height of a column of the sample that, when viewed through the length of the column, visually matches the appropriate one of three glass standards and referring to Table 1 of Test Method D 156.

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 may indicate possible contamination with another product. However, color is not always a reliable guide to product quality and should not be used indiscriminantly 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

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

³ *Annual Book of ASTM Standards*, Vol 05.02.

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			

water. After cleaning, rinse with distilled 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.

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 D 4057.

9. Preparation of Test Specimen

9.1 When the sample is turbid, filter through a sufficient number of qualitative filter papers until it is clear.

9.2 When preparing petroleum wax for testing do not heat excessively, because oxidation can occur, with consequent discoloration of the test specimen.

10. Procedure for Refined Light Oils and Pharmaceutical White Oils

10.1 Flush the oil tube with a portion of the test specimen, taking care to allow the tube to drain thoroughly. Fill the oil tube with the test specimen compare with a whole color

standard. When the test specimen is lighter than the color standard, remove the standard and replace it with a half standard. When the sample is darker than the single whole standard at 6¼ in. (158 mm), add another whole standard. **Caution**—It is important that all samples in the color tubes be free from air bubbles.

10.2 With the proper color standard or standards in place, and the test specimen in the oil tube at a level where its color is decidedly darker than that of the color standard, draw off the test specimen slowly by means of the petcock until the oil appears just slightly darker than the color standard. From this point, draw the test specimen level down to the nearest depth corresponding to color number as shown in Table 1. When the color of the oil observed through the eyepiece is still darker than the color standard, draw the oil down to the next depth given in Table 1, and compare. Continue this operation until a depth is reached where the test specimen and color standard match, or show questionable differences. At this point, lower the oil column to the next specified depth and, when the oil is unmistakably lighter than the color standard, record the color corresponding to the next higher level as the Saybolt color.

10.3 Experience in the use of this instrument will obviate the necessity of following the step-by-step procedure outlined in 10.2 for choosing the proper color standards for each sample. Examples of the procedure are given in Table 2.

TABLE 2 Example of Procedure

Observation	Using One Whole Color Standard, in. (mm)	Using Two Whole Color Standards, in. (mm)
Oil darker at depth of	16 (406)	4.5 (102)
Oil darker at depth of	14 (355)	4.25 (107)
Oil questionable at depth of	12 (304)	4.0 (101)
Oil lighter at depth of	10.75 (273)	3.75 (95)
Saybolt color	+ 21	-2