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AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428
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Standard Test Method for Consistency of Paints Using the Stormer Viscometer[1]

This standard is issued under the fixed designation D 562; 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 Department of Defense.

ε[1] NOTE—Editorial changes were made throughout in September 1997.

1. Scope

1.1 This test method covers the determination of the consistency of paints and related coatings using the Stormer viscometer.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

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

2. Referenced Documents

2.1 *ASTM Standards:*

E 1 Specification for ASTM Thermometers[2]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *consistency*—load in grams to produce a rotational frequency of 200 r/min.

3.1.2 *Krebs units (KU)*—values of a scale commonly used to express the consistency of paints generally applied by brush or roller.

3.1.2.1 *Discussion*—This scale is a log function of the "load to produce 200-r/min" scale.

4. Summary of Test Method

4.1 The load required to produce a rotational frequency of 200 r/min for an offset paddle rotor immersed in a paint is determined.

5. Significance and Use

5.1 This test method provides values that are useful in specifying and controlling the consistency of paints, such as consumer or trade sales products.

6. Apparatus

6.1 *Viscometer*, Stormer, with the paddle-type rotor as illustrated in Fig. 1 and Fig. 2. The stroboscopic timer attachment in Fig. 1 can be removed and the instrument used without it but with a sacrifice of speed and accuracy. The stroboscopic timer gives the 200 r/min reading directly.

6.2 *Container*, 1-pt (500-mL), 3⅜ in. (85 mm) in diameter.

6.3 *Thermometer*—An ASTM Stormer Viscosity thermometer having a range from 20 to 70°C and conforming to the requirements for Thermometer 49C, as prescribed in Specification E 1.

6.4 *Stopwatch*, or suitable timer measuring to 0.2 s.

6.5 *Weights*, a set covering the range from 5 to 1000 g.

7. Materials

7.1 Two standard oils, calibrated in absolute viscosity (poise), that are within the viscosity range of the coatings to be measured. These oils should differ in viscosity by at least 5 P.

NOTE 1—The normal range of the Stormer is covered by oils having viscosities of 4 P (70 KU), 10 P (85 KU), and 14 P (95 KU).

7.1.1 Suitable standards are silicone, hydrocarbon, linseed, and castor oils. Silicone and hydrocarbon oils calibrated in poises are commercially available. Uncalibrated linseed and castor oils may be calibrated with any apparatus that provides measurements of absolute viscosity.

7.1.2 Assign a value of load to produce 200 r/min to each oil by converting its viscosity value in poises to load in grams by the following equation:[3]

$$L = (610\eta + 906.6\,\rho)/30$$

where:

η = viscosity of oil in poises and
ρ = density of oil.

8. Calibration [4]

8.1 Remove the rotor and weight carrier from the viscometer. Make sure the string is wound evenly on the drum and

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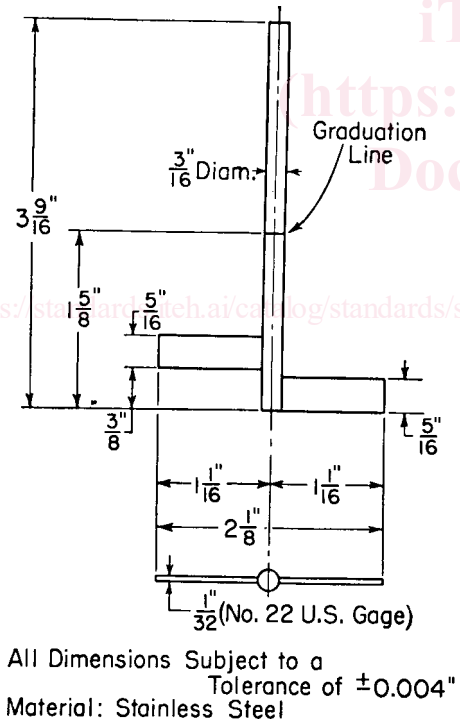
[2] *Annual Book of ASTM Standards*, Vol 14.03.

[3] Geddes, J. A., and Dawson, D. H., "Calculation of Viscosity From Stormer Viscosity Data," *Industrial and Engineering Chemistry*, Vol 34, 1942, p. 163.

[4] Jackson, C. F., and Madson, W. H., "A Method for the Standardization of Krebs Modified Stormer Viscometers," *ASTM Bulletin*, No. 161, 1949.

FIG. 1 Stormer Viscometer with Paddle-Type Rotor and Stroboscopic Timer



NOTE 1—1 in. = 25.4 mm.

FIG. 2 Paddle-Type Rotor for Use With Stormer Viscometer

does not overlap itself.

8.2 Attach a 5-g weight onto the string and then release the brake. If the viscometer starts to run from this dead start and continues to run through several revolutions of the string drum, it is satisfactory for use. If it does not start unaided when the 5-g weight is applied, the instrument should be reconditioned.

8.3 Check the dimensions of the paddle-type rotor. They should be within ±0.004 in. (0.1 mm) of the dimensions shown in Fig. 2.

8.4 Select two standard oils having assigned values of load to produce 200 r/min within the range of the values expected for the coatings to be measured (see 7.1).

8.5 Adjust the temperature of the standard oils to 25± 0.2°C. The temperature of the Stormer apparatus should be the same. If the specified temperature cannot be obtained, record the temperature of the oil at the beginning and end of test to 0.2°C.

8.6 Determine the load in grams to produce 200 r/min with each of the two oils, using either Procedure A described in Section 9 or Procedure B described in Section 10.

8.6.1 If the oil temperature was not at 25 ± 0.2°C during the test, correct the measured load in grams for the deviation from that temperature.

NOTE 2—Load corrections for deviations of oil temperature from the specified temperature can be made by means of a previously established plot of load versus oil temperature (see Appendix X1).

8.7 If the measured load (corrected for any temperature deviation from standard) is within ±15 % of the assigned load values for the oils, the Stormer apparatus can be considered to be in satisfactory calibration.

9. Procedure A (Without Stroboscopic Attachment)

9.1 Thoroughly mix the sample and strain it into a 1-pt (500-mL) container to within ¾ in. (20 mm) of the top.

9.2 Bring the temperature of the specimen to 25 ± 0.2°C and maintain it at that temperature during the test. The temperature of the Stormer apparatus should be the same.

9.2.1 If the specified temperature cannot be obtained, record the temperature of the specimen at the beginning and end of test to 0.2°C.

9.3 When the temperature of the specimen has reached equilibrium, stir it vigorously, being careful to avoid entrapping air, and place the container immediately on the platform of the viscometer so that the paddle-type rotor is immersed in the material to the mark on the shaft of the rotor.

9.4 Place weights on the hanger of the viscometer and determine a load that will produce 100 revolutions in the range of 25 to 35 s.

9.5 Using the information gained in 9.4, select two loads that will provide two different readings (time to give 100 revolutions) within the range of 27 to 33 s. Make these measurements from a running start, that is, permit the rotor to make at least 10 revolutions before starting the timing for 100 revolutions.

9.6 Repeat the measurements outlined in 9.5 until two readings for each load are obtained that agree within 0.5 s.

10. Procedure B (With Stroboscopic Timer)

10.1 Follow Procedure A (9.1-9.3) for the preparation of the specimen.

10.2 Connect the lamp circuit of the stroboscopic attachment to an electrical power source.

10.3 Place weights on the hanger of the viscometer and determine a load that will produce 100 revolutions in the range from 25 to 35 s.

10.4 Using the information gained in 10.3, select a weight