



Standard Test Method for Approximate Acidity in Electrical Insulating Liquids by Color-Indicator Titration¹

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1. Scope

1.1 This test method describes the determination of the approximate total acid value of used electrical insulating liquids having viscosities less than 24 cSt at 40°C. It is a simple procedure that can be applied in the field. Where a quantitative neutralization value is required, use Test Method D 664 or D 974. These test methods should be applied in the laboratory.

1.2 *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 664 Test Method for Acid Number of Petroleum Products by Potentiometric Titration²
- D 974 Test Method for Acid and Base Number by Color-Indicator Titration²
- D 1193 Specification for Reagent Water³

3. Summary of Test Method

3.1 To determine whether the acidity is greater or less than a specified arbitrary value, a fixed volume of liquid to be tested is added to a graduated cylinder, together with a small amount of indicator (phenolphthalein) and the appropriate quantity of standard potassium hydroxide solution. The mixture is shaken and allowed to separate. The color of the aqueous layer at the bottom of the container when testing mineral oils, or at the top when testing askarels, determines whether the acidity is less than or greater than the arbitrary value chosen.

3.2 To determine the approximate total acidity, the procedure is the same as described in 3.1 except that the potassium hydroxide solution is added in small increments until the color of the aqueous layer, after shaking and settling, is a faint pink. The volume of standard potassium hydroxide solution used determines the approximate total acid value.

4. Significance and Use

4.1 The approximate acidity of used electrical insulating oils is an estimate of the total acid value of the oil. As acid values increase, oil quality decreases. This is usually due to oxidation of the oil while in service. In general, acidic by-products produce increased dielectric loss, increased corrosivity, and may cause thermal difficulties attributable to insoluble components called “sludge.” This test method is adapted to a specific volume of oil; total acid values of 0.05 to 0.5 mg of potassium hydroxide per gram of oil is a range which is functionally significant.

5. Apparatus

- 5.1 *Graduated Cylinder*, 50-mL, stoppered.
- 5.2 *Medicine Dropper*, calibrated at 1-mL intervals.
- 5.3 *Calibrated Pipet*, 1-mL capacity, calibrated to deliver 0.05-mL increments.

6. Reagents and Materials

6.1 *Purity of Reagents*—Use reagent grade chemicals in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.⁴ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

6.2 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean reagent water (see Note 1) conforming to Specification D 1193.

NOTE 1—Any grades of water listed in Specification D 1193 are deemed satisfactory for the purpose of this test method.

6.3 *Ethyl or Isopropyl Alcohol*, reagent grade.

6.4 *Phenolphthalein Indicator Solution* (100 g/L)—Dissolve 10 g of phenolphthalein in 100 mL of denatured alcohol by slight warming.

6.5 *Potassium Hydroxide, Standard Solution* (0.031 ± 0.003 N)—Prepare a 0.031 ± 0.003 N solution of potassium

¹ This test method is under the jurisdiction of ASTM Committee D-27 on Electrical Insulating Liquids and Gases and is the direct responsibility of Subcommittee D27.06 on Chemical Test.

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

³ *Annual Book of ASTM Standards*, Vols 10.01 and 11.01.

⁴ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmaceutical Convention, Inc. (USPC), Rockville, MD.