



Standard Test Method for Acid Number of Petroleum Products by Semi-Micro Color Indicator Titration¹

This standard is issued under the fixed designation D 3339; 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.

1. Scope *

1.1 This test method covers the determination of acidic constituents in new or used petroleum products and lubricants soluble or nearly soluble in mixtures of toluene, and isopropyl alcohol. The test method is especially intended for cases in which the amount of sample available to be analyzed is too small to allow accurate analysis by Test Methods D 974 or D 664. It is applicable for the determination of acids having dissociation constants in water larger than 10^{-9} . Extremely weak acids having dissociation constants smaller than 10^{-9} do not interfere. Salts titrate if their hydrolysis constants are larger than 10^{-9} .

1.2 This test method can be used to indicate relative changes in acid number that occur in an oil during use under oxidizing conditions. Although the titration is made under definite equilibrium conditions, the method does not measure an absolute acidic property that can be used to predict performance of an oil under service conditions. No general relationship between bearing corrosion and acid number is known.

1.3 Since this test method requires substantially less sample than Test Methods D 974 or D 664, it provides an advantageous means of monitoring an oxidation test by changes in acid number by (1) minimizing test sample depletion for acid number analyses and thus minimizing the disturbance of the test or (2) allowing additional acid number analyses to be made while maintaining the same test sample depletion and thus providing additional data.

NOTE 1—Some oils, such as many cutting oils, rust-proofing oils, and similar compounded oils, or excessively dark-colored oils, may be more difficult to analyze by this test method due to obscurity of the color-indicator end point. These oils can be analyzed by Test Method D 664 provided sufficient sample is available. However, this situation is much less likely using Test Method D 3339 than using Test Method D 974 due to the use of a more highly dilute sample during the titration and due to the greater stability of the end point color change. The acid numbers obtained by Test Method D 3339 may or may not be numerically the same as those obtained by Test Method D 664 but they should be of the same order of magnitude.

NOTE 2—The results obtained using this method have been found to be numerically the same as those obtained using Test Method D 974, within the precision of the two methods, for new or oxidized lubricants of the type primarily intended for hydraulic or steam turbine type service. The oxidized lubricants were obtained using the Test Method D 943 oxidation test. This correlation is shown by the correlation coefficient $r = 0.989$ with slope $s = +1.017$ and intercept $y = +0.029$, calculated using the acid numbers obtained using both titration methods for the samples used for the precision statement (12.2).²

1.4 The values stated in acceptable SI units are to be regarded as the standard. Values in inch-pound units are for information only.

1.5 *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.* For specific hazard statements, see Sections 7 and 9, A1.1.4, and A2.3.1.

2. Referenced Documents

2.1 ASTM Standards:

- D 664 Test Method for Acid Number of Petroleum Products by Potentiometric Titration³
- D 943 Test Method for Oxidation Characteristics of Inhibited Mineral Oils³
- D 974 Test Method for Acid and Base Number by Color-Indicator Titration³
- D 1193 Specification for Reagent Water⁴

3. Terminology

3.1 Definitions:

3.1.1 *acid number, n* —the quantity of base, expressed in milligrams of potassium hydroxide per gram of sample, that is required to titrate a sample dissolved in a specified solvent to a specified end point.

3.1.1.1 *Discussion*—In this test method, acids or salts with dissociation constants greater than 10^{-9} , are titrated to a green end point with *p*-naphtholbenzein indicator.

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.06 on Analysis of Lubricants.

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² Use of the correlation coefficient is given in Mack, C., *Essentials of Statistics for Scientists and Technologists*, Plenum Press, New York, NY, 1967, or other publications on statistics.

³ *Annual Book of ASTM Standards*, Vol 05.01.

⁴ *Annual Book of ASTM Standards*, Vol 11.01.

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

