



Designation: D 1121 – 98 (Reapproved 2003)

## Standard Test Method for Reserve Alkalinity of Engine Coolants and Antirusts<sup>1</sup>

This standard is issued under the fixed designation D 1121; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

### 1. Scope

1.1 This test method covers the determination of the reserve alkalinity of new, unused engine coolants, and liquid antirusts as received, of used or unused aqueous dilutions of the concentrated materials, and of aqueous dilutions of solid antirusts.

1.2 The values stated in SI units are to be regarded as the standard.

1.3 *This standard does not purport to address all of the safety problems, 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 1123 Test Method for Water in Engine Coolant Concentrate by the Karl Fischer Reagent Method

D 1176 Standard Practice for Sampling and Preparing Aqueous Solutions of Engine Coolants or Antirusts for Testing Purposes<sup>2</sup>

D 1287 Test Method for pH of Engine Coolants and Antirusts<sup>2</sup>

### 3. Terminology

#### 3.1 Definition:

3.1.1 *reserve alkalinity*—the number of millilitres, to the nearest 0.1 mL, of 0.100 *N* hydrochloric acid required for the titration to a pH of 5.5 of a 10-mL sample of an undiluted unused coolant, antirust, or coolant additive, and unused or used solutions thereof.

### 4. Summary of Test Method

4.1 A 10-mL sample of concentrated coolant, antirust, coolant additive, or an aqueous engine coolant containing these

products, is diluted to about 100 mL with water and titrated potentiometrically with 0.100 *N* hydrochloric acid to a pH of 5.5. The volume of acid used is reported to the nearest 0.1 mL. The concentration of coolant or additive in the coolant solution shall be recorded if required, for calculation of depletion of the reserve alkalinity during performance tests.

### 5. Significance and Use

5.1 Reserve alkalinity is the number of millilitres, to the nearest 0.1 mL of 0.100 *N* hydrochloric acid (HCl) required for the titration to a pH of 5.5 of a 10-mL sample of an undiluted, unused coolant, antirust, or coolant additive, and unused or used solutions thereof.

5.2 Reserve alkalinity is a term applied to engine coolants and antirusts to indicate the amount of alkaline components present in the product. It is frequently used for quality control during production, and values are often listed in specifications. When applied to used solutions, reserve alkalinity gives an approximate indication of the amount of remaining alkaline components. Unfortunately, the term is sometimes misused in that its numerical value is said to be directly related to coolant quality, the higher the number, the better the coolant. ASTM Committee D-15 on Engine Coolants believes there is a need to correct some misconceptions and place the term in its proper perspective.

5.3 Reserve alkalinity (R.A.) as defined in Section 3 of this method is the number of millilitres of 0.1-*N* hydrochloric acid required to titrate 10 mL of concentrated coolant to a pH of 5.5. The term is not a completely accurate description of the property being measured because “alkalinity” usually refers to the pH range above 7.0.

5.4 A review of the origin of the term may be helpful in attempting to understand its proper use. When ethylene glycol was first used as an engine coolant, it was uninhibited. The need for inhibition soon became apparent and triethanolamine was incorporated. When solutions of this inhibited glycol were titrated with dilute hydrochloric acid, it was found that the steepest part of the neutralization curve occurred at a pH of about 5.0. Following the introduction of triethanolamine, other buffers, such as borates and phosphates, have been used.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D15 on Engine Coolants and is the direct responsibility of Subcommittee D15.04 on Chemical Properties.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 15.05.