



Standard Test Method for Percent Ash Content of Engine Coolants¹

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

1. Scope

1.1 This test method covers the determination of ash content after ignition of commercial engine coolants and antirusts, as packaged or after use.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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.* Specific warning statements are given in 7.1 and 7.3.

2. Referenced Documents

2.1 *ASTM Standards:*²

D1176 Practice for Sampling and Preparing Aqueous Solutions of Engine Coolants or Antirusts for Testing Purposes
D3306 Specification for Glycol Base Engine Coolant for Automobile and Light-Duty Service

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *ash, n*—the components of an engine coolant not removed by ignition at 750°C.

4. Summary of Test Method

4.1 To determine the ash content, the coolant is weighed, evaporated or charred, and finally ignited at a strong heat.

5. Significance and Use

5.1 This test method is designed to aid in identifying types of coolants. While the ash is primarily due to the inorganic

inhibitors used, it is not a measure of the total inhibitor concentration because of the loss of organic inhibitors.

5.2 An ash content greater than that stated in Specification D3306 may indicate a salt-based product.

6. Apparatus

6.1 *Crucible*, high-silica glass, porcelain, or platinum of 50-mL capacity, equipped with cover.

7. Procedure

7.1 Ignite the crucible and cover over a Meker burner for 5 min and allow to cool to room temperature in a desiccator; then weigh to the nearest 0.1 mg. (**Warning**—When handling a hot crucible use proper caution and safety equipment such as safety glasses, gloves, tongs, etc.)

7.2 Weigh 20 ± 0.1 g of well-mixed coolant (**Note 1**), including all phases, into the crucible. Sample in accordance with Test Method D1176. Record the weight of the sample to the nearest 0.1 mg.

NOTE 1—The weight of sample taken is suitable for most commercial products. If there is reason to believe that the ash content may be high, the sample size may be decreased to 5 or 10 ± 0.1 g.

7.3 Place the covered crucible in a cool small sand bath in a vented hood. Raise the temperature by any convenient means until the liquid is evaporated. If the sample ignites, remove the heat source until the burning ceases; then reapply the heat. (**Warning**—Many types of coolant have tendencies to spatter upon heating, with consequent loss of sample and erroneous results. All precautions consistent with good laboratory practice should be followed.) (**Warning**—Avoid inhalation of the fumes.)

7.4 When the crucible appears dry, transfer the crucible to a support over a Meker-type burner. Ignite strongly at red heat until all carbonaceous material disappears from both crucible and cover. The crucible cover may be removed and carefully ignited, directly if desired, taking care to avoid losing any material deposited on the underside of the cover. Place the crucible and cover, with contents, in a desiccator to cool. When they have cooled to room temperature, weigh the crucible, cover, and contents (ash) to the nearest 0.1 mg. Proceed to 7.6.

¹ This test method is under the jurisdiction of ASTM Committee D15 on Engine Coolants and Related Fluids and is the direct responsibility of Subcommittee D15.04 on Chemical Properties.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

7.5 If desired, muffle furnace ignition may be used in place of the Meker-type burner. If a muffle furnace is used, proceed as specified in 7.1 through 7.3, and then complete the procedure as follows: When the crucible appears dry, place the crucible and cover, with contents, in a muffle furnace. (To prevent losses from spattering due to rapid burning or volatilization of constituents, the muffle furnace shall be below 200°C when this transfer is made.) Raise the temperature at the maximum rate to between 750 and 900°C and ignite for 1 h at this temperature. Place the crucible and cover, with contents, in a desiccator to cool. When they have cooled to room temperature, weigh the crucible, cover, and contents (ash) to the nearest 0.1 mg.

7.6 Repeat the ignition and cooling until constant weight is obtained.

8. Calculation

8.1 Calculate ash, %, as follows:

$$\text{ash} = \frac{A - B}{C - B} \times 100 \quad (1)$$

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where:

- A = mass of crucible, cover, and ash,
- B = mass of crucible and cover, and
- C = mass of crucible, cover, and sample.

9. Precision and Bias

9.1 The reproducibility for engine coolants should be within $\pm 20\%$ of the mean.

10. Keywords

10.1 ash; engine coolant