



Designation: D7933 – 22

Standard Test Method for Engine Coolant Stagnation in Flux-Brazed Aluminum Heat Exchangers¹

This standard is issued under the fixed designation D7933; 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 a laboratory screening procedure for evaluating engine coolant compatibility and corrosion protection after aging two weeks at 90 °C in an aluminum heat exchanger brazed using flux.

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

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D1176 Practice for Sampling and Preparing Aqueous Solutions of Engine Coolants or Antirusts for Testing Purposes

D1193 Specification for Reagent Water

D4340 Test Method for Corrosion of Cast Aluminum Alloys in Engine Coolants Under Heat-Rejecting Conditions

E230/E230M Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples

3. Summary of Test Method

3.1 An aluminum heat exchanger that was brazed using flux via any application method or as part of the material cladding

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 D15.21 on Extended Life Coolants.

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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.

is filled with engine coolant, plugged, and placed in an oven for two weeks (336 h) at 90 °C. Engine coolant compatibility is assessed based on changes in coolant physical and compositional properties, and engine coolant aluminum corrosion protection is based on performance in the Test Method D4340 test.

4. Significance and Use

4.1 Automobile and truck radiators and heater cores are now predominantly made with aluminum alloys using various manufacturing processes including brazing with a flux (See Appendix X1 for additional information). The presence of residual internal brazing flux in heat exchangers along with the high ratio of internal aluminum surface area to coolant volume may affect certain physical and chemical properties and corrosion protection of the coolant. This test method provides a screening test to assess engine coolant physical and chemical properties and corrosion protection after aging it in a heat exchanger brazed with flux at elevated temperature under stagnant conditions. This method cannot stand alone as evidence of satisfactory coolant performance in flux-brazed aluminum heat exchangers. The actual service of an engine coolant formulation can be determined only by more comprehensive bench, dynamometer, and field tests.

5. Apparatus

5.1 *Aluminum Heat Exchanger Brazed with Flux*—The heat exchanger may be a radiator, heater core, or other, liquid cooled heat exchanger.

NOTE 1—The aluminum brazed heat exchangers used in this test method may be commercially produced or experimentally prepared by the heat exchanger supplier. The aluminum grade, alloying, flux loading during brazing, and residual flux remaining in the heat exchanger after brazing may vary from part to part. The heat exchanger type, manufacturer, size, and other design parameters are decided by mutual agreement of the parties involved.

5.2 *Coolant Hoses, Clamps, Hose Adapters, and Caps or Plugs*—Rubber engine coolant hoses (approximately 15 cm length) of appropriate diameter shall be fitted onto heat exchanger inlet/outlets to allow for coolant expansion. EPDM is one type hose material suitable for the test. Metal clamps, hose adapters, and threaded caps or plugs (stainless steel, or steel) shall be used to seal the heat exchanger during the