



Designation: D8040 – 18 (Reapproved 2023)

Standard Test Method for Corrosion Test for Heat Transfer Fluids in Glassware¹

This standard is issued under the fixed designation D8040; 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 simple beaker-type procedure for evaluating the effects of heat transfer fluids (HTF) on metal specimens under controlled laboratory conditions. Fluids tested under this method are specifically designed for heating and air conditioning (HVAC) systems.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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.* Specific hazards statements are given in [10.1.7.2](#), [10.1.7.3](#), [10.1.7.4](#), and [A1.1.6](#).

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

[B32 Specification for Solder Metal](#)

[B36/B36M Specification for Brass Plate, Sheet, Strip, and Rolled Bar](#)

[D1384 Test Method for Corrosion Test for Engine Coolants in Glassware](#)

[E1 Specification for ASTM Liquid-in-Glass Thermometers](#)

[E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods](#)

[E178 Practice for Dealing With Outlying Observations](#)

[E230 Specification for Temperature-Electromotive Force \(emf\) Tables for Standardized Thermocouples](#)

[E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

2.2 ASTM Adjunct:³

All-glass apparatus for corrosion test (2 drawings)

3. Summary of Test Method

3.1 In this test method, specimens of metals typical of those present in HVAC systems are totally immersed in aerated HTF solutions for 336 h at 88 °C (190 °F). The corrosion-inhibitive properties of the test solution are evaluated on the basis of the weight changes incurred by the specimens. Each test is run in triplicate, and the average weight change is determined for each metal. A single test may occasionally be completely out of line (see [11.2](#)).

4. Significance and Use

4.1 This test method will generally distinguish between HTFs that are definitely deleterious from the corrosion standpoint and those that are suitable for further evaluation. However, the results of this test method cannot stand alone as evidence of satisfactory corrosion inhibition. The actual service value of an HTF formulation can be determined by more comprehensive evaluation and field tests, agreed between customer and supplier.

5. Apparatus

5.1 *Container*, a 1000 mL, tall-form, spoutless beaker, made of heat-resistant glass, for containing the HTF solution and test

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 [D15.30](#) on Industrial Heat Transfer Fluids.

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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.

³ Details available from ASTM International Headquarters. Order Adjunct No. [ADJD1384](#). Original adjunct produced in 1980.

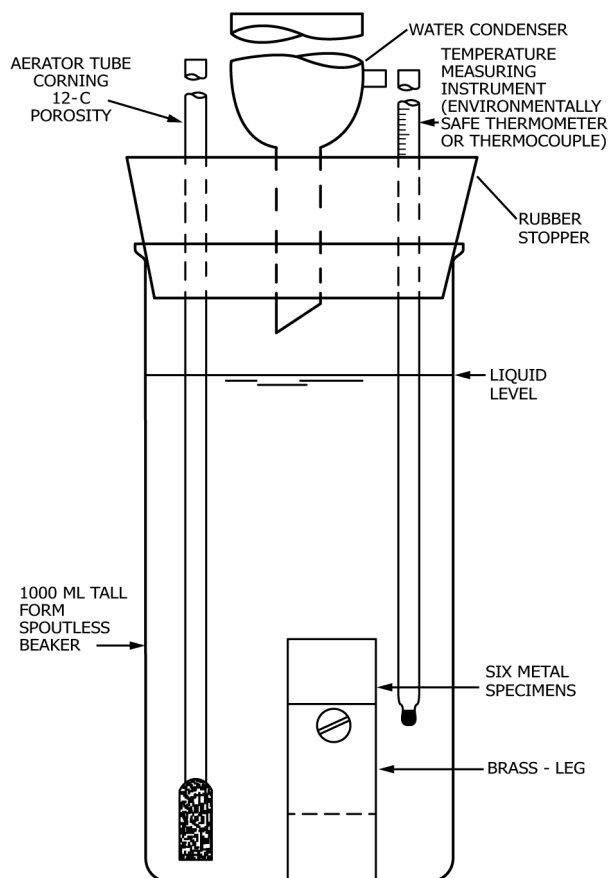


FIG. 1 Metal Specimens and Equipment for 336 h Corrosion Test

specimens. The beaker shall be tightly closed with a No. 15 rubber stopper, having drill holes to accommodate a water condenser, an aerator tube, and a thermometer as shown in Fig. 1. Optionally, an all-glass apparatus may be used.⁴

5.2 *Condenser*, a water condenser of the reflux, glass-tube type, having a 400 mm (16 in.) condenser jacket.

5.3 *Aerator Tube*, a gas-dispersion tube, porosity size 12-C,⁵ to ensure continuous aeration without plugging.

5.4 *Temperature Measuring Instrument (Environmentally Safe Thermometer or Thermocouple)*, an ASTM Partial Immersion Temperature Measuring Instrument having a range from -20°C to 150°C (0°F to 302°F) and conforming to the requirements for Thermometer 1C (1F), as prescribed in Specification E1 or Thermocouple as summarized in Specification E230.

⁴ The sole source of supply of the apparatus known to the committee at this time is Corning Glass Works. Gas-dispersion tube No. 39533, manufactured by Corning Glass Works, 44-5 Crystal St., Corning, NY, has generally been found satisfactory for this purpose. Optionally, a capillary tip bleed tube with 0.28 in. (7 mm) bore and 11.2 in. (280 mm) length may be used when consistent early plugging of gas dispersion tubes occurs. The tube, catalog No. 7815-19, may be obtained from Corning Glass Works, Corning, NY 14830. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.

⁵ If a water bath is used, a significant reduction in evaporation rate is achieved by addition of floating plastic chips on the water surface.

5.5 *Heater*, a constant-temperature bath containing a high-boiling liquid (see Note 1) that is capable of giving continuous service with the specified temperature control. The size of the bath will be determined by the number of corrosion tests that are to be run concurrently.

NOTE 1—The specimens prescribed in this test method may not be the same as that of alloys currently used for HVAC cooling system components. However, they offer a broad range of metals and are customarily used for research and product screening. Specimens other than those designated in this test method may be used by mutual agreement of the parties involved.

6. Metal Test Specimens

6.1 *Type*—The following metal test specimens⁶ shall be used:

6.1.1 *Steel*, UNS G10200 (SAE 1020),⁷ cut from 1.59 mm ($\frac{1}{16}$ in.) cold-rolled sheet stock to size 50.8 mm by 25.4 mm (2 in. by 1 in.). Chemical composition of the carbon steel is as follows: carbon, 0.17 % to 0.23 %; manganese, 0.30 % to 0.60 %; phosphorus, 0.040 % maximum; sulfur, 0.050 % maximum.

⁶ Unified numbering system for metals and alloys, SAE-ASTM, July 1995.

⁷ A round-robin evaluation of coated solder report is available from ASTM International Headquarters and may be obtained by requesting Research Report RR:D15-0132. Contact ASTM Customer Service at service@astm.org.