



Designation: D2070 – 23

Standard Test Method for Thermal Stability of Hydraulic Oils¹

This standard is issued under the fixed designation D2070; 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 method² is designed primarily to evaluate the thermal stability of hydrocarbon based hydraulic oils although oxidation may occur during the test.

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:*³

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

2.2 *Copper Development Association Standard*⁴

UNS C11000 Electrolytic Tough Pitch Copper

2.3 *American Iron and Steel Institute Standard (AISI)*⁵

W-1 Carbon Tool Steel

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.N0 on Hydraulic Fluids.

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² This procedure was adopted from the Fives Cincinnati Thermal Stability Test Procedure “A”, Fives Cincinnati Manual 10-SP-89050.

³ 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.

⁴ Available from Copper Development Assoc., Inc., 260 Madison Ave., New York, NY 10016, <http://www.copper.org>.

⁵ Available from American Iron and Steel Institute (AISI), 25 Massachusetts Ave., NW, Suite 800, Washington, DC 20001, <http://www.steel.org>.

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminology D4175.

4. Summary of Test Method

4.1 A beaker containing test oil, copper and steel rods is placed in an aluminum block in an electric gravity convection oven for 168 h at a test temperature of 135 °C. At the completion of the test, the copper and steel rods are rated visually for discoloration and the oil is analyzed for the quantity of sludge.

5. Significance and Use

5.1 Thermal stability characterizes physical and chemical property changes which may adversely affect an oil’s lubricating performance. This test method evaluates the thermal stability of a hydraulic oil in the presence of copper and steel at 135 °C. No correlation of the test to field service has been made.

6. Apparatus

6.1 An aluminum block with equally spaced holes is used. An example is described in Fig. A1.1 and Fig. A1.2 of Annex A1.

6.2 Electric gravity convection oven capable of maintaining the aluminum block at a test temperature of 135 °C ± 1 °C.

6.2.1 Calibrated thermocouple and temperature indicator centered in aluminum block.

6.3 250 mL Griffin beakers of borosilicate glass.

6.4 Copper test specimens are to be UNS C11000, 99.9 % pure electrolytic tough pitch copper, 6.35 mm in diameter by 7.6 cm in length (0.25 in. by 3.0 in.).^{6,7}

6.5 Steel test specimens are to be AISI W-1 1 % carbon steel, 6.35 mm in diameter 7.6 cm in length (0.25 in. by 3.0 in.).^{6,7}

⁶ The sole source of supply of the apparatus known to the committee at this time is Metaspec LLC, 790 W. Mayfield Blvd., San Antonio, TX 78211, metaspec@earthlink.net.

⁷ 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.

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