



Standard Test Method for Oxidation Stability of Gasoline Automotive Engine Oils by Thin-Film Oxygen Uptake (TFOUT)¹

This standard is issued under the fixed designation D4742; 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.

^{ε1} NOTE—Updated units statement in 1.3 and improved figure quality editorially in November 2009.

1. Scope*

1.1 This test method evaluates the oxidation stability of engine oils for gasoline automotive engines. This test, run at 160°C, utilizes a high pressure reactor pressurized with oxygen along with a metal catalyst package, a fuel catalyst, and water in a partial simulation of the conditions to which an oil may be subjected in a gasoline combustion engine. This test method can be used for engine oils with viscosity in the range from 4 mm²/s (cSt) to 21 mm²/s (cSt) at 100°C, including re-refined oils.

1.2 This test method is not a substitute for the engine testing of an engine oil in established engine tests, such as Sequence IIID.

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

1.3.1 *Exception*—Pressure units are provided in psig, and dimensions are provided in inches in [Annex A1](#), because these are the industry accepted standard and the apparatus is built according to the figures shown.

1.4 *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.* For specific warning statements, see Sections [7](#) and [8](#).

2. Referenced Documents

2.1 ASTM Standards:²

¹ This test method is under the jurisdiction of ASTM Committee [D02](#) on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee [D02.09.06](#) on Oxidation Testing of Engine Oils.

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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.

- [A314 Specification for Stainless Steel Billets and Bars for Forging](#)
- [B211 Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire](#)
- [D664 Test Method for Acid Number of Petroleum Products by Potentiometric Titration](#)
- [D1193 Specification for Reagent Water](#)
- [D2272 Test Method for Oxidation Stability of Steam Turbine Oils by Rotating Pressure Vessel](#)
- [D4057 Practice for Manual Sampling of Petroleum and Petroleum Products](#)
- [E1 Specification for ASTM Liquid-in-Glass Thermometers](#)

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *break point*—the precise point of time at which rapid oxidation of the oil begins.

3.1.2 *oxidation induction time*—the time until the oil begins to oxidize at a relatively rapid rate as indicated by the decrease of oxygen pressure.

3.1.3 *oxygen uptake*—oxygen absorbed by oil as a result of oil oxidation.

4. Summary of Test Method

4.1 The test oil is mixed in a glass container with three other liquids that are used to simulate engine conditions: (1) an oxidized/nitrated fuel component ([Annex A2](#)), (2) a mixture of soluble metal naphthenates (lead, copper, iron, manganese, and tin naphthenates ([Annex A3](#))), and (3) Type I reagent water.

4.2 The glass container holding the oil mixture is placed in a high pressure reactor equipped with a pressure gauge. The high pressure reactor is sealed, charged with oxygen to a pressure of 620 kPa (90 psig), and placed in an oil bath at 160°C at an angle of 30° from the horizontal. The high pressure reactor is rotated axially at a speed of 100 r/min forming a thin film of oil within the glass container resulting in a relatively large oil-oxygen contact area.

NOTE 1—A pressure sensing device can be used in place of a pressure gauge.

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