Designation: D 5704 – 04

An American National Standard

Standard Test Method for Evaluation of the Thermal and Oxidative Stability of Lubricating Oils Used for Manual Transmissions and Final Drive Axles[1]

This standard is issued under the fixed designation D 5704; 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 is commonly referred to as the L-60-1 test.[2] It covers the oil-thickening, insolubles-formation, and deposit-formation characteristics of automotive manual transmission and final drive axle lubricating oils when subjected to high-temperature oxidizing conditions.

1.2 The values stated in inch-pound units are to be regarded as the standard except for the catalyst weight loss and oil weight measurements, for which the unit is gram; the oil volume, for which the unit is millilitre; the alternator output, for which the unit is watt; and the air flow, for which the unit is milligram per minute. The other SI values, which are 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 and health practices and determine the applicability of regulatory limitations prior to use.* Specific warning information is given in Sections 7 and 8 and Annex A3.

2. Referenced Documents

2.1 *ASTM Standards:* [3]

B 224 Classification of Coppers

D 235 Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)

D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity)

D 664 Test Method for Acid Number of Petroleum Products by Potentiometric Titration

D 893 Test Method for Insolubles in Used Lubricating Oils

E 527 Practice for Numbering Metals and Alloys (UNS)

2.2 *ANSI Standard:*[4]

ANSI/ISA-S7.3 Quality Standard for Instrument Air

2.3 *Military Specification:*[5]

MIL-L-2105D Lubricating Oil, Gear, Multipurpose

2.4 *ASTM Adjuncts:* [6]

Engineering Drawings

3. Terminology

3.1 *Definitions:*

3.1.1 *carbon, n—in manual transmissions and final drive axles*, a hard, dry, generally black or gray deposit that can be removed by solvents but not by wiping with a cloth.

3.1.2 *lubricant, n—in manual transmission and final drive axles*, lubricating oil.

3.1.3 *sludge, n—in manual transmissions and final drive axles*, a deposit principally composed of the lubricating oil and oxidation products that do not drain from parts but can be removed by wiping with a cloth.

3.1.4 *thermal and oxidative stability, n—in lubricating oils used for manual transmissions and final drive axles*, a lack of deterioration of the lubricating oil under high-temperature conditions that is observed as viscosity increase of the lubricating oil, insolubles formation in the lubricating oil, or deposit formation on the parts, or a combination thereof.

3.1.5 *varnish, n—in manual transmissions and final drive axles*, a hard, dry, generally lustrous deposit that can be removed by solvents but not by wiping with a cloth.

4. Summary of Test Method

4.1 A sample of the lubricant to be tested is placed in a heated gear case containing two spur gears, a test bearing, and

[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.B0 on Automotive Lubricants.

Current edition approved May 1, 2004. Published June 2004. Originally approved in 1995. Last previous edition approved in 2003 as D 5704–03a.

[2] Until the next revision of this test method, the ASTM Test Monitoring Center (TMC) will update changes in this test method by means of Information Letters. Information Letters may be obtained from the ASTM Test Monitoring Center, 6555 Penn Ave., Pittsburgh, PA 15206-4489. Attention: Administrator. This edition incorporates revisions in all Information Letters through 03–5. The TMC is also the source of reference oils.

[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] Joint standard of ANSI/ISA. Available from Instrument Society of America, 67 Alexander Drive, P.O. Box 12277, Research Triangle Park, NC 27709.

[5] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098.

[6] Detailed drawings necessary for rig construction. Available from ASTM International Headquarters. Order Adjunct No. ADJD5704.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States.