



Standard Test Method for Evaluating Wear Characteristics of Tractor Hydraulic Fluids¹

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1. Scope*

1.1 This test method is used to screen lubricants for gear wear. It is primarily applicable to tractor hydraulic fluids but may be suitable for other applications.

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 and health practices and determine the applicability of regulatory limitations prior to use.* Specific warning information is given in Sections 7 and 9.

2. Referenced Documents

2.1 ASTM Standards:²

D235 Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)

D323 Test Method for Vapor Pressure of Petroleum Products (Reid Method)

D329 Specification for Acetone

D4175 Terminology Relating to Petroleum, Petroleum Products, and Lubricants

2.2 Deutsches Institut für Normung (DIN):³

DIN 17210 Part 1: Tolerances for Spur Gears; Tolerances for the Deviation of Singly Determined Values

DIN 3962 Casehardened Steel; Material Specifications

DIN 50150 Testing of Steel and Cast Steel Conversion Table for Vickers Hardness, Brinell Hardness, Rockwell Hardness and Tensile Strength

DIN 51354 Mechanical Testing of Gear Oils in the FZG Gear Test Machine

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.B0.03 on Automotive Gear Lubricants & 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 DIN standards are available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

3. Terminology

3.1 Definitions:

3.1.1 *abrasive wear, n*—wear due to hard particles or hard protuberances forced against and moving along a solid surface. **D4175**

3.1.2 *scoring, n—in tribology*, a severe form of wear characterized by the formation of extensive grooves and scratches in the direction of sliding. **D4175**

3.1.3 *scratches, n*—the result of mechanical removal or displacement, or both, of material from a surface by the action of abrasive particles or protuberances sliding across the surfaces. **D4175**

3.1.4 *scuffing, n—in lubrication*, damage caused by instantaneous localized welding between surfaces in relative motion that does not result in immobilization of the parts. **D4175**

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *wear, n*—the loss of material from contacting surfaces of the gear teeth.

4. Summary of Test Method

4.1 A modified FZG gear oil test machine is operated for 20 h under controlled conditions of speed (100 r/min), torque (tenth stage), and temperature (121 °C). Test gears are lubricated with the test oil.

4.2 The test gears are weighed and visually examined before and after the test. The gear mass loss and the visually observed damage to the gear teeth are used to evaluate the wear obtained with the test fluid.

5. Significance and Use

5.1 Many modern tractor designs use the hydraulic fluid to lubricate the transmission and final drive gears. This test method is used to assess the suitability of the tractor hydraulic fluids as lubricants for transmission and final drive gears of tractors.

6. Apparatus

6.1 *FZG Gear Oil Test Machine*—The test machine is described in **Annex A1** and illustrated in **Fig. A2.1** and **Fig. A3.1**.

6.2 *Precision Test Gears*—The test gears are standard FZG tooth profile A gears as described in **Annex A1** and **Table A1.1**.

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