



Designation: D4998 – 13 (Reapproved 2021)

## Standard Test Method for Evaluating Wear Characteristics of Tractor Hydraulic Fluids<sup>1</sup>

This standard is issued under the fixed designation D4998; 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 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* Specific warning information is given in Sections 7 and 9.

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:*<sup>2</sup>

- D235 Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent) (Withdrawn 2021)<sup>3</sup>
- D323 Test Method for Vapor Pressure of Petroleum Products (Reid Method)
- D329 Specification for Acetone
- D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

<sup>1</sup> 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.

Current edition approved Oct. 1, 2021. Published November 2021. Originally approved in 1989. Last previous edition approved in 2013 as D4998 – 13. DOI: 10.1520/D4998-13R21.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

2.2 *Deutsches Institut für Normung (DIN):*<sup>4</sup>

- 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

### 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.

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