



Designation: D7450 – 19

Standard Specification for Performance of Rear Axle Gear Lubricants Intended for API Category GL-5 Service¹

This standard is issued under the fixed designation D7450; 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 specification covers test methods and acceptance criteria for determining the acceptability of gear oils for applications that specify a lubricant meeting the performance requirements of API Category GL-5 service. Lubricants that meet these performance requirements are typically intended for use in automotive axles, particularly those containing hypoid gears, operating under various combinations of high-speed/shock-load and low-speed/high-torque conditions.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered 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:*²

D130 Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test

D892 Test Method for Foaming Characteristics of Lubricating Oils

D5704 Test Method for Evaluation of the Thermal and

Oxidative Stability of Lubricating Oils Used for Manual Transmissions and Final Drive Axles

D6121 Test Method for Evaluation of Load-Carrying Capacity of Lubricants Under Conditions of Low Speed and High Torque Used for Final Hypoid Drive Axles

D7038 Test Method for Evaluation of Moisture Corrosion Resistance of Automotive Gear Lubricants

D7452 Test Method for Evaluation of the Load Carrying Properties of Lubricants Used for Final Drive Axles, Under Conditions of High Speed and Shock Loading

D8165 Test Method for Evaluation of Load-Carrying Capacity of Lubricants Used in Hypoid Final-Drive Axles Operated under Low-Speed and High-Torque Conditions

2.2 *Military Standards:*³

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

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

MIL-PRF-2105E Lubricating Oil, Gear, Multipurpose

2.3 *SAE Documents:*⁴

J306 Automotive Gear Lubricant Viscosity Classification

J2360 Lubricating Oil, Gear Multipurpose (Metric) Military Use

3. Terminology

3.1 *Definitions:*

3.1.1 *ridging, n*—on ring and pinion gears, an alteration of the tooth surface to give a series of parallel raised and polished ridges running diagonally in the direction of sliding motion, either partially or completely across the tooth surfaces of gears. **D6121**

3.1.2 *rippling, n*—on ring and pinion gears, an alteration of the tooth surface to give an appearance of a more or less regular pattern resembling ripples on water or fish scales. **D6121**

3.1.3 *pitting, n*—on ring and pinion gears, small irregular cavities in the tooth surface, resulting from the breaking out of small areas of surface metal. **D6121**

¹ This specification is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.B0 on Automotive Lubricants.

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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 Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, http://www.dodssp.daps.mil

⁴ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, http://www.sae.org.

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

3.1.4 *spalling, n—on ring and pinion gears*, the breaking out of flakes of irregular area of the tooth surface, a condition more extensive than pitting. **D6121**

3.1.5 *scoring, n—on ring and pinion gears*, the rapid removal of metal from the tooth surfaces caused by the tearing out of small contacting particles that have welded together as a result of metal-to-metal contact; the scored surface is characterized by a matte or dull finish. **D6121**

3.1.6 *wear, n—on ring and pinion gears*, the removal of metal, without evidence of surface fatigue or adhesive wear, resulting in partial or complete elimination of tool or grinding marks or development of a discernible shoulder ridge at the bottom of the contact area near the root or at the toe or heel end of pinion tooth contact area (abrasive wear). **D6121**

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *lubricated, adj*—having its surface coated with phosphate.

4. Performance Classification

4.1 *API Category GL-5*—The designation API Category GL-5 is designed to identify the category of lubricants intended

for gears, particularly those in automotive axles equipped with hypoid gears, operating under various combination of high-speed/shock-load and low-speed/high-torque conditions. Approved lubricants under the SAE J2360 Standard, the MIL-L-2105C Specification, the MIL-L-2105D Specification, and the MIL-PRF-2105E Specification satisfy the requirements of API Category GL-5. Note that these standards and specifications contain performance requirements that exceed those of API Category GL-5.

5. Performance Requirements

5.1 API Category GL-5 performance requirements for candidate gear lubricants using the most current test methods and procedures are provided in **Table 1**.

6. Keywords

6.1 axle lubricants; gear lubricants; high-speed/shock-load; hypoid gear lubricants; hypoid gears; low-speed/high-torque

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