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.

Designation: D7690 – 11 (Reapproved 2017)

Standard Practice for Microscopic Characterization of Particles from In-Service Lubricants by Analytical Ferrography[1]

This standard is issued under the fixed designation D7690; 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 practice covers the identification by optical microscopy of wear and contaminant particles commonly found in used lubricant and hydraulic oil samples that have been deposited on ferrograms. This practice relates to the identification of particles, but not to methods of determining particle concentration.

1.2 This practice interfaces with but generally excludes particles generated in the absence of lubrication, such as may be generated by erosion, impaction, gouging, or polishing.

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

1.4 *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.*

1.5 *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]

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

D7684 Guide for Microscopic Characterization of Particles from In-Service Lubricants

G40 Terminology Relating to Wear and Erosion

3. Terminology

3.1 *Definitions:*

3.1.1 *abrasion, n*—wear by displacement of material caused by hard particles or hard protuberances. **D4175**

3.1.2 *abrasive wear, n*—wear due to hard particles or hard protuberances forced against and moving along a solid surface. **G40**

3.1.3 *adhesive wear, n*—wear due to localized bonding between contacting solid surfaces leading to material transfer between the two surfaces or loss from either surface. **G40**

3.1.4 *break-in, n*—See *run-in*. **D4175, G40**

3.1.5 *break in, v*—See *run in*. **G40**

3.1.6 *catastrophic wear, n*—rapidly occurring or accelerating surface damage, deterioration, or change of shape caused by wear to such a degree that the service life of a part is appreciably shortened or its function is destroyed. **G40**

3.1.7 *corrosion, n*—chemical or electrochemical reaction between a material, usually a metal surface, and its environment that can produce a deterioration of the material and its properties. **D4175**

3.1.8 *corrosive wear, n*—wear in which chemical or electrochemical reaction with the environment is significant. **G40**

3.1.9 *debris, n—in tribology*, particles that have become detached in a wear or erosion process. **G40**

3.1.10 *debris, n—in internal combustion engines,* solid contaminant materials unintentionally introduced in to the engine or resulting from wear. **D4175**

3.1.11 *fatigue wear, n*—wear of a solid surface caused by fracture arising from material fatigue. **G40**

3.1.12 *fretting, n—in tribology*, small amplitude oscillatory motion, usually tangential, between two solid surfaces in contact.

3.1.12.1 *Discussion*—Here the term *fretting* refers only to the nature of the motion without reference to the wear, corrosion, or other damage that may ensue. The term *fretting* is often used to denote fretting corrosion and other forms of

[1] This practice is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.96.06 on Practices and Techniques for Prediction and Determination of Microscopic Wear and Wear-related Properties.

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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.

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