



Designation: D7918 – 23

Standard Test Method for Measurement of Flow Properties and Evaluation of Wear, Contaminants, and Oxidative Properties of Lubricating Grease by Die Extrusion Method and Preparation¹

This standard is issued under the fixed designation D7918; 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 covers the determination and evaluation of flow properties, wear levels, contaminants, and oxidative condition of new and in-service lubricating grease.

1.2 This test method provides guidance on evaluating in-service grease samples, NLGI grades 00 to 3, for wear, consistency, contamination, and oxidation.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3.1 *Exception*—The exception to this will be where units of references were developed by the developers of the test equipment and necessary to report the results of the test.

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, health, and environmental 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.*

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 D02.96.07 on Integrated Testers, Instrumentation Techniques for In-Service Lubricants.

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2. Referenced Documents

2.1 ASTM Standards:²

D217 Test Methods for Cone Penetration of Lubricating Grease

D6300 Practice for Determination of Precision and Bias Data for Use in Test Methods for Petroleum Products, Liquid Fuels, and Lubricants

D6595 Test Method for Determination of Wear Metals and Contaminants in Used Lubricating Oils or Used Hydraulic Fluids by Rotating Disc Electrode Atomic Emission Spectrometry

D7527 Test Method for Measurement of Antioxidant Content in Lubricating Greases by Linear Sweep Voltammetry

D7546 Test Method for Determination of Moisture in New and In-Service Lubricating Oils and Additives by Relative Humidity Sensor

D7718 Practice for Obtaining In-Service Samples of Lubricating Grease

D7843 Test Method for Measurement of Lubricant Generated Insoluble Color Bodies in In-Service Turbine Oils using Membrane Patch Colorimetry

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Terminology

3.1 Definitions:

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.

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

3.1.1 *active grease sampling device*, *n*—device designed to take an active sample of a lubricating grease from a bearing, gear, or drive shaft located in a grease lubricated component.

D7718

3.1.1.1 *Discussion*—The Grease Thief (trademarked) Type 2³ is a tool which meets this description and can be used to obtain an active grease sample from a lubricated component. A full description and dimensions of this device can be found in **Annex A2**.

3.1.2 *active sampling*, *v*—to use a sampling device to actively gather an in-service lubricating grease sample from a grease-lubricated component.

D7718

3.1.3 *calibration*, *n*—the determination of the values of the significant parameters by comparison with values indicated by a set of reference standards.

D6595

3.1.4 *consistency*, *n*—of lubricating grease, the degree of resistance to movement under stress.

D217

3.1.4.1 *Discussion*—The term “consistency” is used somewhat synonymously with “penetration.” Generally, consistency refers to the worked penetration of a grease.

3.1.5 *linear sweep voltammetry*, *n*—a test method designed to monitor the anti-oxidant additive content in lubricating greases.

D7527

3.1.6 *lubricating grease*, *n*—a semi-fluid to solid product of dispersion of a thickener in a liquid lubricant.

D217

3.1.6.1 *Discussion*—The dispersion of the thickener forms a two-phase system and immobilizes the liquid lubricant by surface tension and other physical forces. Other ingredients are commonly included to impart special properties.

3.1.7 *in-service lubricating grease*, *n*—lubricating grease that has been applied as a lubricant to a gear, bearing, or drive screw for any period of time.

D7718

3.1.8 *passive grease sampling device*, *n*—a device designed to gather a sample from the equipment by being attached to the grease reservoir at the purge point.

D7718

3.1.8.1 *Discussion*—The Grease Thief (trademarked) Type 1³ is a tool which meets this description and can be used to obtain a representative grease sample from a purge path. A full description and dimensions of this device can be found in **Annex A1**.

3.1.9 *passive sampling*, *v*—to use a passive grease sampling device to collect a purged sample of in-service lubricating grease from a purge path.

D7718

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *die extrusion index*, *n*—an average of three unique test conditions of the in-service lubricating grease sample ex-

pressed as a percent when compared to the average of three unique test conditions of the unused lubricating grease baseline.

3.2.2 *die extrusion tester*, *n*—a device that measures the consistency of in-service lubricating greases and compares the measurement to the values obtained from a baseline sample of lubricating grease.

3.2.3 *ferrous debris level*, *n*—the total amount of ferrous metal as measured by a Hall-effect sensor in the grease sample independent of particle size.

3.2.4 *full attenuation*, *n*—the loss of intensity in signal strength.

3.2.5 *grease colorimetry*, *n*—the science of color measurement by the evaluation of the CIE LAB values of grease in the visible light region of the electromagnetic spectrum.

3.2.6 *grease ribbon*, *n*—grease that is extruded onto a substrate.

3.2.7 *indexing die*, *n*—a single-use orifice die to measure the consistency as compared to the baseline.

3.2.8 *spring cell calibration cylinder*, *n*—a cylinder that houses a spring and a push rod to compress the spring.

3.2.9 *substrate*, *n*—the single-use strip onto which a ribbon of grease is extruded.

3.2.10 *substrate segment*, *n*—a peel-away section of the substrate containing a portion of the extruded grease; the segments are pre-cut to hold 0.25 g of extruded grease ribbon.

3.2.11 *speed 1*, *n*—the slowest speed in which the grease is extruded from the indexing die.

3.2.12 *speed 2*, *n*—the fastest speed in which the grease is extruded from the indexing die.

3.2.13 *speed 3*, *n*—the intermediate speed at which the grease is extruded from the indexing die.

4. Summary of Test Method

4.1 Testing of a grease sample includes steps that characterize the ferrous wear within the sample, the consistency of the sample, and properties related to its chemistry.

4.2 A grease sample of known volume is measured to determine the density of ferrous material in the sample.

4.3 A grease sample held with a defined geometry sample holder is placed into a temperature-controlled instrument and extruded onto a substrate as a thin ribbon or strip of grease. The extrusion process provides a measurement of the consistency of the grease.

4.4 The test method requires the grease to be tested at three different rates to reflect the non-Newtonian nature of greases. Testing at several different rates creates a series of step changes that are then compared to an unused baseline grease that has also been tested under the same conditions.

4.5 While the flow properties are being measured, the grease is simultaneously deposited onto a thin-film substrate containing substrate segments. Each substrate segment contains approximately 0.25 g of grease. The individual substrate segments are used for further testing of wear, contamination, and oxidative properties.

³ The Grease Thief Type I and Type II is described in US Patent No. 7984661. Interested parties are invited to submit information regarding the identification of an alternative(s) to this patented item to the ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. The sole source of the Grease Thief Type I and Type II are known to the committee is York Laboratories, LLC located at 410 Kings Mill Rd., York, PA 17401. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.