



Designation: D4425 – 24

Standard Test Method for Oil Separation from Lubricating Grease by Centrifuging (Koppers Method)¹

This standard is issued under the fixed designation D4425; 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 a procedure for determining the tendency of lubricating grease to separate oil when subjected to high centrifugal forces.

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.*

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

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

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

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminology D4175.

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

¹ This test method is under the jurisdiction of Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.G0.03 on Physical Tests.

Current edition approved Nov. 1, 2024. Published November 2024. Originally approved in 1984. Last previous edition approved in 2019 as D4425 – 19. DOI: 10.1520/D4425-24.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.1.2.1 *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.

3.1.3 *thickener, n*—in lubricating grease, a substance composed of finely-divided particles dispersed in a liquid to form the products's structure.

3.1.3.1 *Discussion*—Thickeners can be fibers (such as various metallic soaps) or plates or spheres (such as certain non-soap thickeners), which are insoluble or, at most, only very slightly soluble in the liquid lubricant. The general requirements are that the solid particles be extremely small, uniformly dispersed, and capable of forming a relatively stable, gel-like structure with the liquid lubricant.

3.2 Symbols:

a	= distance from top of grease surface to tube mouth (mm).
b	= height of liquid column in an inverted test tube (mm).
d	= test tube inside diameter (mm).
H	= accumulated test time at a given reading (h).
$K36$	= resistance to centrifugal separation (V/H).
r	= measured at the maximum radius of rotation (mm).
rpm	= rotational speed (r/min).
V	= volume of separated oil, as a percentage of the original grease volume (%).
V_g	= grease volume in a test tube (cm ³).
V_o	= volume of separated oil (cm ³).
V_t	= test tube total volume (cm ³).
A	= angle of rotor, between the test tube axis and axis of rotation (degrees).
ω	= rotational speed (rad/s).
G	= relative centrifugal acceleration.

3.3 The relative effect of centrifugal forces, when related to the gravitational standard acceleration (9.81 m/s²), is noted with the symbol G . It can be calculated as follows:

$$G = 1.02 \times 10^{-4} \times r \times \omega^2 \quad (1)$$

or

$$G = 1.12 \times 10^{-6} \times r \times \text{rpm}^2 \quad (2)$$

4. Summary of Test Method

4.1 Pairs of centrifuge tubes are charged with grease samples and are placed in the centrifuge. The grease samples

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