



Standard Test Methods for Cone Penetration of Lubricating Grease¹

This standard is issued under the fixed designation D 217; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 These test methods cover four procedures for measuring the consistency of lubricating greases by the penetration of a cone of specified dimensions, mass, and finish. The penetration is measured in tenths of a millimetre.

NOTE 1—The National Lubricating Grease Institute² (NLGI) classified greases according to their consistency as measured by the worked penetration. The classification system is as follows:

NLGI Consistency Number	Worked Penetration Range, 25°C (77°F)
000	445 to 475
00	400 to 430
0	355 to 385
1	310 to 340
2	265 to 295
3	220 to 250
4	175 to 205
5	130 to 160
6	85 to 115

1.1.1 The procedures for unworked, worked, and prolonged worked penetration are applicable to greases having penetrations between 85 and 475, that is, to greases with consistency numbers between NLGI 6 and NLGI 000. An undisturbed penetration test, described in Appendix X1, is similar to the unworked penetration test.

1.1.2 The block penetration procedure is applicable to greases that are sufficiently hard to hold their shape. Such greases usually have penetrations below eighty-five tenths of a millimetre.

1.2 None of the four procedures is considered suitable for the measurement of the consistency of petrolatums by penetration. Test Method D 937 should be used for such products.

1.3 The dimensions of the equipment described in these test methods are given in inches and fractions of an inch. These units were retained because a vast body of data has been obtained using equipment with the dimensions shown. Metric equivalency tables are provided with each figure. Temperatures and other dimensions are given in the preferred SI units; the values shown in parentheses are provided for information.

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.*

2. Referenced Documents

2.1 ASTM Standards:

D 937 Test Method for Cone Penetration of Petrolatum³

D 1403 Test Methods for Cone Penetration of Lubricating Grease Using One-Quarter and One-Half Scale Cone Equipment³

3. Terminology

3.1 Definitions:

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

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

3.1.2 *lubricant, n*—any material interposed between two surfaces that reduces the friction or wear between them.

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

3.1.3.1 *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.

3.1.4 *penetrometer, n*—an instrument that measures the consistency or hardness of semiliquid to semisolid materials by

¹ These test methods are the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and are the direct responsibility of Subcommittee D02.G0 on Lubricating Grease. In the IP, these test methods are under the jurisdiction of the Standardization Committee. These test methods were adopted as a joint ASTM-IP standard in 1969.

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² National Lubricating Grease Institute, 4635 Wyandotte St., Kansas City, MO 64112-1596.

³ *Annual Book of ASTM Standards*, Vol 05.01.