



Designation: D7342 – 20

Standard Test Method for Prolonged Worked Stability of Lubricating Grease in Presence of Water (Water Stability Test)¹

This standard is issued under the fixed designation D7342; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope*

1.1 This test method covers a procedure for determining the shear stability of lubricating grease in the presence of water (wet shear stability) by a full scale grease worker. This test method is also known as the water stability test.

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
- D217 Test Methods for Cone Penetration of Lubricating Grease
 - D1193 Specification for Reagent Water
 - D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

3. Terminology

3.1 Definitions:

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

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.G0.02 on Consistency and Related Rheological Tests.

Current edition approved June 1, 2020. Published September 2020. Originally approved in 2007. Last previous edition approved in 2015 as D7342 – 15. DOI: 10.1520/D7342-20.

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.

3.1.1.1 *Discussion*—The term *consistency* is used somewhat synonymously with *penetration*. Generally, consistency refers to the worked penetration of a grease. **D217**

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

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. **D217**

3.1.3 *penetration, n—of lubricating grease*, depth that the standard cone, when released to fall under its own weight for 5 s, enters the sample. **D217**

3.1.4 *prolonged worked penetration, n—of lubricating grease*, the penetration of a sample after it has been worked more than 60 double strokes in a standard grease worker at a temperature of 15 °C to 30 °C (59 °F to 86 °F).

3.1.4.1 *Discussion*—After the prescribed number of double strokes, the worker and contents are brought to 25 °C (77 °F), worked an additional 60 double strokes, and penetrated without delay.

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

3.1.5.1 *Discussion*—The thickener can be fibers (such as various metallic soaps) or plates or spheres (such as certain non-soap thickener) which are insoluble or, at most, only very slightly soluble in 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. **D217**

3.1.6 *worked penetration, n—of lubricating grease*, the penetration at 25 °C, without delay, of a sample after 60 double strokes in a standard grease worker. **D217**

3.1.7 *working, n—of lubricating grease*, subjection of a sample to the shearing action of the standard grease worker. **D217**

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *wet shear stability, n—of lubricating grease*, change in consistency of a mixture of sample and small amount of water after a specified amount of working in a grease worker.

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

4. Summary of Test Method

4.1 A grease sample mixed with a small amount of water is subjected to low shear at 20 °C to 35 °C for a specified time or strokes in a standard grease worker. The difference between the cone penetration before working and the cone penetration after is used as a measure of the wet shear stability of the grease.

5. Significance and Use

5.1 It is known that contamination by water can affect the shear stability of some greases in service. This test method is widely used to determine the wet shear stability of greases in service. Many grease specifications require these procedures as a wet shear stability test. No accurate correlation is established between the test results and wet shear stability of grease in actual service.

6. Apparatus

6.1 *Motorized Grease Worker*, as specified in Test Methods **D217**.

6.2 *Penetrometer*, as specified in Test Methods **D217**.

6.3 *Electric Kitchen-type mixer*, Low speed of 500 r/min.

6.4 *Suitable Mixing Bowl*.

6.5 *Spatula*.

7. Reagents and Materials

7.1 *Appropriate Volatile Gum-free Solvent*, for example, mineral spirit solvent.

7.2 *Cloth or Paper Wiper*, for wiping grease from the penetrometer cone. The wiper should be soft, so as not to scratch the surface of the cone.

7.3 *Distilled Water*, Specification **D1193**, Type II minimum purity.

8. Procedure

8.1 The sample of grease is obtained in accordance with Test Methods **D4057**.

8.2 Measure the initial worked penetration for the grease to be tested according to Test Methods **D217**.

8.3 For each determination, prepare a homogeneous mixture of grease and water by placing 450 g ± 1 g of grease and 50 g ± 1 g of distilled water in a suitable mixing bowl using an electric kitchen-type mixer or mixing by hand in a suitable container.

8.3.1 Gradually add the calculated amount of distilled water to the grease in the bowl.

8.3.2 Mix the contents for 4 min ± 1 min. A spatula may be used to channel the constituents to the mixer.

8.3.3 The objective of foregoing sections is to produce a mixture of nine parts of grease and one part of water that transfer to a worker cup.

NOTE 1—If free water is observed after mixing, then additional mixing is required.

8.4 Fill a standard Test Methods **D217** grease worker with the mixture and work the sample on a motorized grease worker for 100 000 double strokes (approximately 28 h). After working is completed, bring the grease worker and the sample to 25 °C ± 0.5 °C in accordance with the procedure described in Test Methods **D217** for prolonged worked penetration.

8.5 Immediately after the grease sample reaches 25 °C ± 0.5 °C, rework the sample an additional 60 double strokes. Determine the final prolonged worked penetration.

9. Calculation

9.1 Calculate the change in consistency of the sample as follows:

$$\text{Penetration change} = P_2 - P_1 \quad (1)$$

where:

P_2 = final prolonged worked penetration reading, and

P_1 = initial worked penetration reading.

NOTE 2—Penetration reading is measured in tenths of a millimetre. A negative penetration change indicates hardening of grease while a positive penetration change indicates softening.

10. Report

10.1 The value calculated in 9.1 is reported with the test procedure as the wet shear stability of the grease.

11. Precision and Bias³

11.1 *Precision*—The precision of this test method as determined by a statistical examination of interlaboratory test results shown in **Table 1**. The round robin samples are listed in **Table 2**.

11.1.1 *Repeatability*—The difference between successive results obtained by the same operator with the same apparatus under constant operating conditions on identical test materials would, in the long run, in normal and correct operation of the test method exceed the following values only in one case in twenty:

20 penetration units

11.1.2 *Reproducibility*—The difference between two single and independent results obtained by different operators working in different laboratories on identical test material would, in the long run, in the normal and correct operation of the test method, exceed the following values only in one case in twenty:

26 penetration units

11.2 *Bias*—This test method has no bias because the value of the relative wet shear stability of grease can be defined only in terms of the test method.

12. Keywords

12.1 cone penetration; consistency; grease worker; lubricating grease; penetration; water stability test; wet shear stability

³ Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D02-1824. Contact ASTM Customer Service at service@astm.org.