Designation: D1263 – 94 (Reapproved 2005)ε1

Standard Test Method for Leakage Tendencies of Automotive Wheel Bearing Greases[1]

This standard is issued under the fixed designation D1263; 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.

ε[1] NOTE—Warning notes were editorially moved into text in May 2005.

1. Scope

1.1 This test method covers the evaluation of the leakage tendencies of wheel bearing greases when tested under prescribed laboratory conditions.

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

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 and health practices and determine the applicability of regulatory limitations prior to use.* For specific hazard information see 8 and Annex A2.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D217 Test Methods for Cone Penetration of Lubricating Grease

D3527 Test Method for Life Performance of Automotive Wheel Bearing Grease

D4175 Terminology Relating to Petroleum, Petroleum Products, and Lubricants

D4290 Test Method for Determining the Leakage Tendencies of Automotive Wheel Bearing Grease Under Accelerated Conditions

E1 Specification for ASTM Liquid-in-Glass Thermometers

E77 Test Method for Inspection and Verification of Thermometers

3. Terminology

3.1 *Definitions:*

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

3.1.1.1 *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**

3.1.2 *lubricant*, *n*—any material interposed between two surfaces that reduces the friction or wear between them. **D4175**

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

3.1.3.1 *Discussion*—The solid thickener can be fibers (such as various metallic soaps) or plates or spheres (such as certain non-soap thickeners) which are insoluble or, at the most, only very sightly 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. **D217**

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *automotive wheel bearing grease*, *n*—a lubricating grease specifically formulated to lubricate automotive wheel bearings at relatively high grease temperatures and bearing speed. **D3527**

3.2.2 *leakage*, *n—of wheel bearing grease*, separation and overflow of grease or oil from the bulk grease charge, induced by high temperature and bearing rotation. **D4290**

4. Summary of Test Method

4.1 The grease is distributed in a modified front-wheel hub and spindle assembly. The hub is rotated at a speed of 660 ± 30 rpm for 6 h ± 5 min, at a spindle temperature which is raised to and then maintained at 105 ± 1.2°C (220 ± 2.5°F). Leakage of grease or oil, or both, is measured, and the condition of the bearing surface is noted at the end of the test.

[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.G0 on Lubricating Grease.

Current edition approved May 1, 2005. Published May 2005. Originally approved in 1953. Last previous edition approved in 1999 as D1263–94(1999). DOI: 10.1520/D1263-94R05E01.

[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.

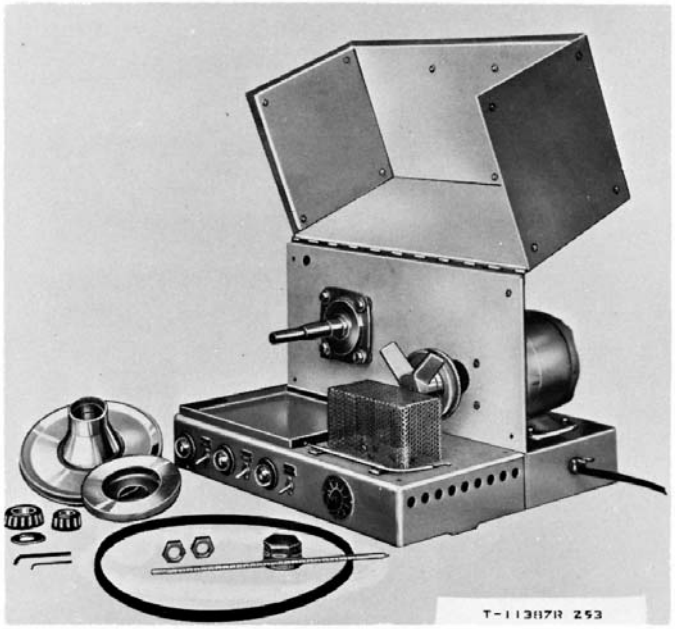


FIG. 1 Apparatus for Testing Leakage Tendencies of Wheel Bearing Greases

5. Significance and Use

5.1 The test method provides a screening device that permits differentiation among products having distinctly different leakage characteristics (Note 1). It is not the equivalent of longtime service tests, nor is it intended to distinguish between wheel bearing greases showing similar or borderline leakage.

NOTE 1—It is possible for skilled operators to observe significant changes in other important grease characteristics that occurred during the test. Such additional information can be of special interest to individual operators. The observations, however, are subject to differences in personal judgment among operators, and cannot be used effectively for quantitative rating.

6. Apparatus

6.1 The apparatus shown in Fig. 1 and Fig. 2 has been found suitable and is described in detail in Annex A1. The tester consists of a special front wheel hub and spindle assembly, the hub being rotated by an electric motor through a V-belt drive. The assembly is encased in a thermostatically controlled air bath. Means of measuring both ambient (cabinet) and spindle temperatures are provided. A torque wrench, suitable for use on 31.75-mm (1¼-in.) hexagonal nuts, is also required.[3]

6.2 The apparatus (spindle, case, and motor) must be electrically grounded, otherwise the thermocouples will not function due to accumulated static charges. Provision is made for this, as shown in Fig. 2.

6.3 Machines furnished with 660-W heaters have been found suitable, and these will usually provide the proper heat input to attain the temperatures in the specified time intervals. However, if it is found that proper balance cannot be obtained, heaters of the required wattage can be substituted.

7. Test Bearings

7.1 The inner bearing (tapered roller) is Timken 15118. The corresponding cup is No. 15250. The smaller, outer bearing, is Timken 09074, with corresponding cup No. 09196.

8. Reagent

8.1 *ASTM n-Heptane*—99.87 % purity SRM 1815. (**Warning—**Flammable. Harmful if inhaled.)

9. Procedure

9.1 Weigh 90 ± 1 g of sample on a flat plate. Using a spatula, pack 2 ± 0.1 g of grease in the small bearing and 3± 0.1 g in the large bearing (Note 2). Distribute the balance of the test grease (85 g) in a uniform layer on the inside of the hub (Note 3). Apply a thin film of grease to the bearing races in the hub.

NOTE 2—A narrow, wedge-cut spatula has been found of considerable aid in packing the bearings.

NOTE 3—The balance of the test grease will fill the hub practically even with the races, and, with the exception of very fibrous greases, can be distributed readily and uniformly by use of a spatula having a 150-mm (6-in.) blade.

9.2 Weigh separately the leakage collector and the hub cap to the nearest 0.1 g. Place the leakage collector and the large (inner) bearing in the proper position on the spindle . Put the hub and small (outer) bearing on the spindle, followed by the loose-fitting retainer ring . With the torque wrench, tighten the hexagonal nut which holds the hub assembly in place, applying a torque of 6.8 ± 0.1 N·m (60 ± 2 lbf·in.). Then back off the hexagonal nut 60 ± 5° (or one flat), and lock it in position with a second hexagonal nut. Screw on the hub cap, put the V-belt on the pulleys, and close the cabinet. (**Caution:** All grease collectors should be inspected carefully to make sure that the inner lip is flush with the sealing face. Otherwise, this lip will interfere with the correct seating of the inner bearing. In assembling the packed hub on the spindle, care should be taken to prevent contact between grease pack and spindle. From time to time, the drive pulley and the driven pulley should be checked for alignment. Misalignment can introduce leakage variations.)

NOTE 4—Excessive end play of the hub assembly is sometimes due to worn bearings. Therefore new bearings, both cups and cones, should be installed after each 250 tests, or sooner if inspection indicates wear or other damage to the bearings.

9.3 After closing the cabinet turn on the motor and both heaters. Operate at a speed of 660 ± 30 rpm for 6 h ± 5 min, the spindle temperature being raised to 105± 1.4°C (220 ± 2.5°F) then maintained for the balance of the test period. The spindle temperature of 105 ± 1.4°C is obtained by maintaining an ambient temperature of 115 ± 3°C (235 ± 5°F). Leave the auxiliary heater on only until an ambient or oven temperature of 115°C is attained. It is desirable to have the thermoregulator

[3] Wrenches meeting these requirements are available from a number of companies. One example is listed in the catalog of the Snap-On Tools Corp., 8028 28th Ave., Kenosha, WI, as No. TQ 12A. A suitable adapter and socket are required to match this type wrench and nut. 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.

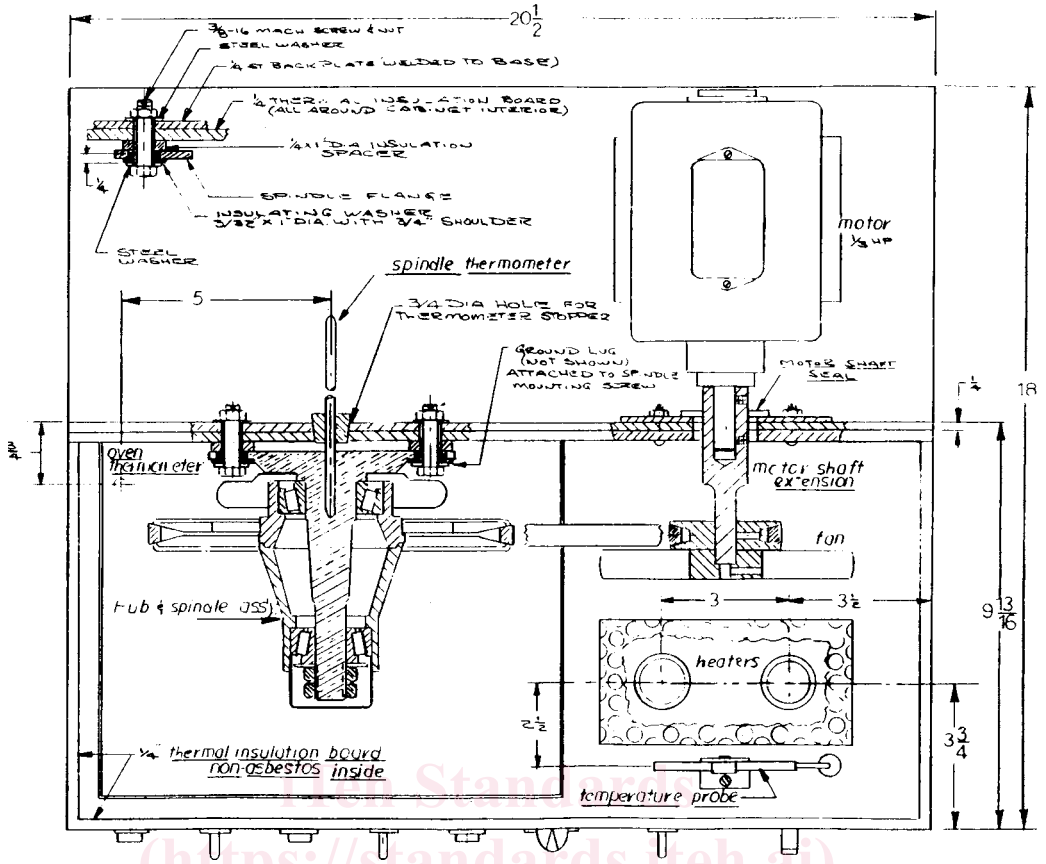


FIG. 2 Details of Main Assembly

previously adjusted to maintain a 115°C oven temperature, or to have a reproducible setting for this temperature. The ambient temperature of 115 ± 3°C shall be attained within 15 ± 5 min. The spindle temperature of 105± 1.4°C shall be attained within 60 ± 10 min. This combination results in the spindle holding 105 ± 1.4°C for 5 h ± 15 min. (**Caution:** Drafts can affect the rate of heating. Care should therefore be exercised in the location of the tester.)

9.4 At the end of the 6-h test period, that is, 6 h from the time the motor and heaters are turned on, shut off the power and dismantle the apparatus while hot. Wear appropriate protective clothing to permit the handling of hot equipment.

9.5 After the apparatus has cooled, weigh separately the leakage collector and the hub cap to the nearest 0.1 g.

NOTE 5—If the leakage collector overflows, the overflow grease or oil, or both, should be weighed and included in the total leakage reported.

9.6 Wash the two bearings in ASTM *n*-heptane (**Warning**—see 8.1) for at least 2 min at room temperature to remove the grease (see Note 6). Inspect for varnish, gum, or lacquer-like deposits.

NOTE 6—With some wheel bearing greases, it will be found that the soaps are not completely washed from the bearings with *n*-heptane. A film of soap may, therefore, remain on the bearings. This film can be readily distinguished from varnish, gum, or lacquer-like deposits resulting from deterioration of the lubricant.

10. Report

10.1 Report the total amount of leakage of grease or oil, or both, into the collector and into the hub cap.

10.2 Report the presence on the bearing surface of any adherent deposit of varnish, gum, or lacquer-like material, which is evident after removal of the grease (Note 6).

11. Precision and Bias [4]

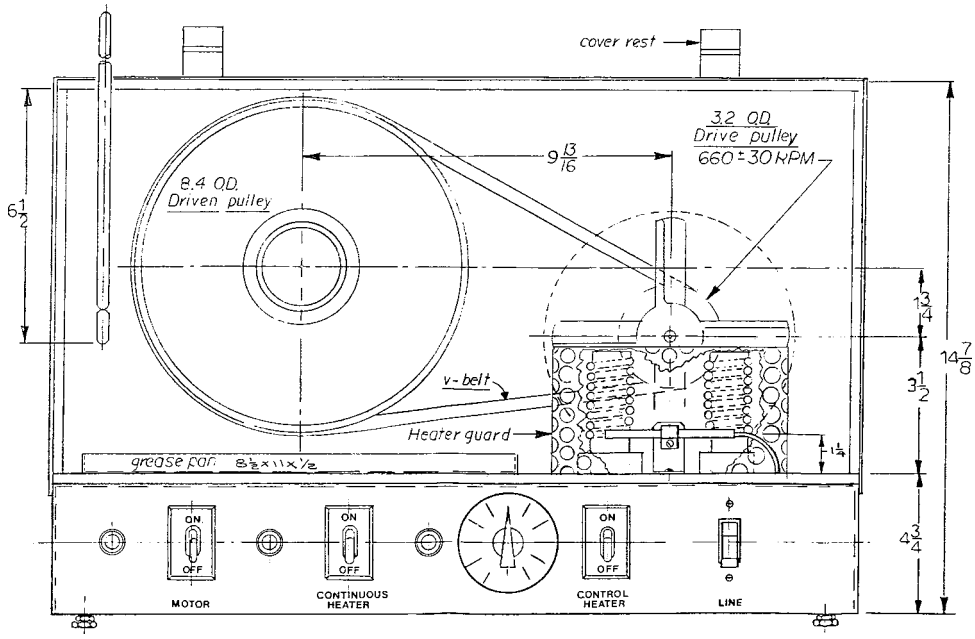
11.1 The precision of this test is not known to have been obtained in accordance with currently accepted guidelines (for example, in Committee D02 Research Report D2-1007.)

11.2 The precision of the test method as determined by statistical examination of interlaboratory results is as follows:

11.2.1 *Repeatability*—The difference between two test results, obtained by the same operator with the same apparatus under constant operating conditions 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:

Leakage in Area of	Acceptable Difference
2 g	1.5 g
15 to 20 g	9 g

[4] There is no Research Report on file because this method was developed before Research Report guidelines were instituted and data are no longer available.



Metric Equivalents

in.	mm	in.	mm	in.	mm
20½	521	5	127	1	25.4
19⁵⁄₁₆	491	4⅞	124	¾	19.1
13½	337	3½	88.9	½	12.7
11	279	3⅜	85.7	⅜	9.5
9¾	248	3¼	82.6	⁵⁄₁₆	7.9
9½	241	3.2	81.3	¼	6.4
9⅜	238	3	76	³⁄₁₆	4.8
8½	216	2	51	³⁄₃₂	2.4
8.4	213	1¾	44.5	0.074	1.88
8	203	1⅝	41.3	16 threads/in. spacing 0.63 mm ¼ hp = 187 W	
6½	165	1½	38.1		

FIG. 2 Details of Main Assembly *(continued)*

11.2.2 *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:

Leakage in Area of	Acceptable Difference
2 g	4 g
15 to 20 g	9 g

11.3 *Bias*—The procedure in Test Method D1263 for measuring leakage tendencies of automotive wheel bearing greases has no bias because the value of leakage can be defined only in terms of a test method.

12. Keywords

12.1 automotive wheel bearing; leakage; lubricating grease; wheel bearing grease