



Designation: D1264 – 18

Standard Test Method for Determining the Water Washout Characteristics of Lubricating Greases¹

This standard is issued under the fixed designation D1264; 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 U.S. Department of Defense.

1. Scope*

1.1 This test method covers the evaluation of the resistance of a lubricating grease to washout by water from a bearing, when tested at 38 °C and 79 °C (100 °F and 175 °F) under the prescribed laboratory conditions. It is not to be considered the equivalent of service evaluation tests. Precision and bias was determined using grease ranging from NLGI 3 to 0 grades in the research report (see Section 10).

1.2 This test method may not be suitable for some greases containing highly volatile components. This test method does not attempt to account for sample evaporation. It is the user's responsibility to determine if evaporation of the sample is a significant contributor to mass loss at the required drying temperature.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

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.* For specific warning statements, see 6.3.

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.*

* 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.G0.06 on Functional Tests - Contamination.

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2. Referenced Documents

2.1 *ASTM Adjuncts:*

Standard Ball Bearing²

D2PP, Version 4.43, Determination of Precision and Bias Data for Use in Test Methods for Petroleum Products³

3. Summary of Test Method

3.1 The grease is packed into a ball bearing, the bearing is then inserted in a housing with specified clearances, and rotated at 600 r/min \pm 30 r/min. Water, controlled at the specified test temperature, impinges on the bearing housing at a rate of 5 mL/s \pm 0.5 mL/s. The amount of grease washed out in 60 min \pm 1 min is a measure of the resistance of the grease to water washout.

4. Significance and Use

4.1 This test method estimates the resistance of greases to water washout from ball bearings under conditions of the test. No correlation with field service has been established.

5. Apparatus

5.1 *Ball Bearing*, Size 6204 deep groove ball bearing containing eight 7.9 mm ($5/16$ in.) balls, separated by a two-piece, pressed steel cage, having an internal free volume of 6.5 cm³ \pm 0.5 cm³. ADJD3336² bearings meet these requirements, however other bearings with the same dimensions may be used.

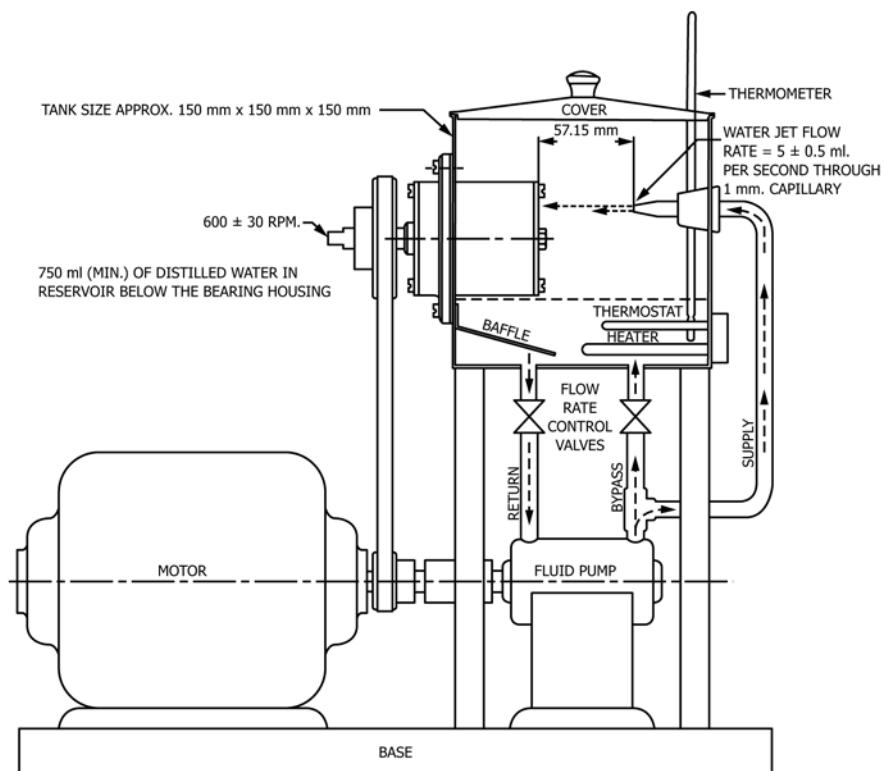
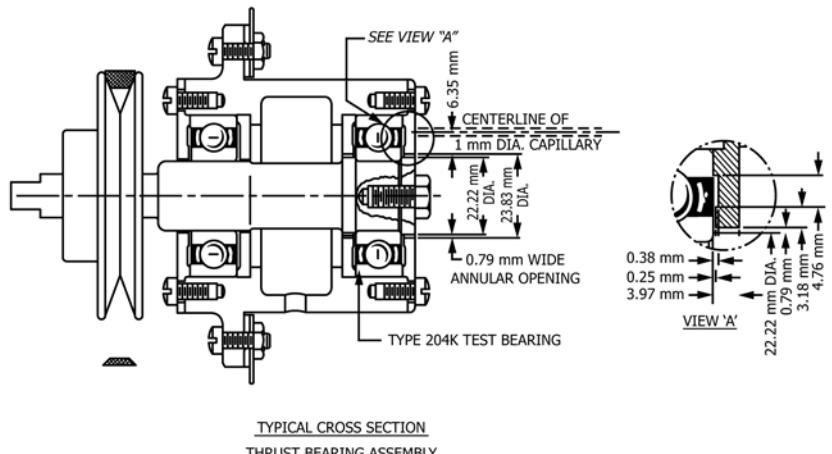
5.2 *Bearing Housing and Shield* with dimensions as shown in Fig. 1.

5.3 *Reservoir, Bearing-Housing Mount, Circulating Pump, and Drive Motor*, similar or equivalent to those shown in Fig. 1.

² Available from ASTM International Headquarters. Order Adjunct No. ADJD3336. Original adjunct produced in 1984.

³ ADJD6300 is no longer available.

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



in.	mm	in.	mm	°F	°C
0.010	0.25	0.875	22.22	100 ± 3	38 ± 1.7
0.015	0.38	0.938	23.81	174 ± 3	79 ± 1.7
0.031	0.79	2 ¹ / ₄	57.1		
1/8	3.18	6	152		
5/32	3.97				
3/16	4.76				
1/4	6.35				

FIG. 1 Water Washout Characteristics of Lubricating Grease Apparatus

5.4 *Heating Source*, to maintain the water temperature at $38^{\circ}\text{C} \pm 1.7^{\circ}\text{C}$ ($100^{\circ}\text{F} \pm 3^{\circ}\text{F}$) or $79^{\circ}\text{C} \pm 1.7^{\circ}\text{C}$ ($174^{\circ}\text{F} \pm 3^{\circ}\text{F}$).

NOTE 1—Suitable temperature control may be obtained by the use of immersion heaters, steam coils, or infrared heat lamps, in conjunction with transformers or thermostats.

5.5 *Thermometer or Thermocouple*, to determine the temperature of the water reservoir.

6. Materials and Reagents

6.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the committee on Analytical Reagents of the American Chemical Society, where such specifications are available.⁴ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

6.2 Distilled Water

6.3 *Cleaning Solvent*—Capable of sufficiently cleaning the test bearing for use in the test. Either reagent grade Stoddard solvent, also known as Mineral Spirits, (**Warning**—Combustible. Vapor harmful), or American Chemical Society reagent grade *n*-heptane⁴ (**Warning**—Flammable. Harmful if inhaled) has been found suitable for use.

7. Preparation of Apparatus

7.1 Clean the reservoir and water passages by flushing with distilled water. Wipe off any oil scum which has been deposited on the surfaces of the reservoir (see **Note 2**). Clean the test bearing (see **Note 3**) with cleaning solvent (see 6.3).

NOTE 2—Following high water washout greases (washout >15 %), additional care should be taken to ensure all oil and grease deposits are cleaned out of the water passages and reservoir prior to subsequent runs. It has been seen that residue in the recirculation lines can become lodged in the spray nozzle, affecting the water jet flow rate and/or point of impingement on the end plate during the course of a test run. To help prevent grease from entering the recirculation lines, an optional coarse screen could be placed over the water intake line. If a screen is used, it should be cleaned prior to each test run.

NOTE 3—Test bearings may be re-used for this test method. The bearings should be cleaned of test grease and dried following a completed test run and stored in a suitable manner to prevent corrosion, such as in a desiccator. The bearings should be inspected prior to use to ensure they are freely turning and free of corrosion or grease thickener residue from prior test runs.

8. Procedure

8.1 Pack the tared bearing with $4.00\text{ g} \pm 0.05\text{ g}$ of test grease. Insert the bearing and tared shields into the housing, and assemble the unit in the test apparatus.

⁴ Reagent Chemicals, American Chemical Society Specifications, American Chemical Society, Washington, DC. For Suggestions on the testing of reagents not listed by the American Chemical Society, see Annual Standards for Laboratory Chemicals, BDH Ltd., Poole, Dorset, U.K., and the United States Pharmacopeia and National Formulary, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.

8.2 Add a minimum of 750 mL of preheated distilled water to the reservoir, but keep the water level below the bearing housing. Without starting the bearing, start the water circulating pump while diverting the water spray from the housing by means of a piece of tubing attached to the capillary discharge tube or with a deflecting metal shield until equilibrium temperature is attained. When the test is to be made at the test temperatures of $38^{\circ}\text{C} \pm 1.7^{\circ}\text{C}$ ($100^{\circ}\text{F} \pm 3^{\circ}\text{F}$) or $79^{\circ}\text{C} \pm 1.7^{\circ}\text{C}$ ($174^{\circ}\text{F} \pm 3^{\circ}\text{F}$), it will be necessary to heat the water to the specified temperature by a previously selected source of heat.

8.2.1 If the rig has one motor driving both pump and test bearing, remove the belt from the test bearing spindle pulley during water warm-up time.

8.3 When the water reaches the specified temperature, adjust the bypass valve to give a water-flow rate, through the rubber tubing and into a glass graduate, of $5\text{ mL/s} \pm 0.5\text{ mL/s}$ (**Note 4**). Remove the rubber tubing from the capillary discharge tube, and adjust the water jet so that it impinges on the end plate 6 mm ($\frac{1}{4}$ in.) above the outer opening of the bearing housing. Start the bearing.

NOTE 4—Sufficient experience should be obtained with a particular tester to make sure that the water-flow rate can be maintained within the specified limits for a $60\text{ min} \pm 1\text{ min}$ test run.

8.4 With the bearing operating at a speed of $600\text{ r/min} \pm 30\text{ r/min}$, continue the operation for $60\text{ min} \pm 1\text{ min}$.

8.5 Shut off the motor and heating source, if used. Remove the test bearing and shields and place them on a tared watch glass, with the shields being separated from the bearing and placed with their inner faces upward to expose the wet grease to the air.

8.6 Dry the bearing and shields for $15\text{ h} \pm 0.25\text{ h}$ at $77^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($170^{\circ}\text{F} \pm 4^{\circ}\text{F}$), and then weigh to determine the grease loss (**Note 5**). The grease remaining on the shields, and any leakage occurring during the drying period, should not be considered as grease lost. Duplicate tests shall be run.

NOTE 5—Some weight loss may be experienced for greases containing highly volatile oils because of evaporation during drying.

NOTE 6—Some greases contain components that make it difficult to completely dry the sample at $77^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($170^{\circ}\text{F} \pm 4^{\circ}\text{F}$). If a weight gain is observed after drying for 15 h at $77^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($170^{\circ}\text{F} \pm 4^{\circ}\text{F}$), then the sample should be dried for an additional 15 h at $93^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($200^{\circ}\text{F} \pm 4^{\circ}\text{F}$). If a weight gain is still observed after drying for 15 h at $93^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($200^{\circ}\text{F} \pm 4^{\circ}\text{F}$), then the sample should be dried for an additional 15 h at $115^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($239^{\circ}\text{F} \pm 4^{\circ}\text{F}$). If needed, each additional drying step should commence on the same day that the previous drying step completed. Between drying steps, the sample should be kept in a desiccator, and great care should be used when handling the sample to avoid removing any material.

9. Report

9.1 Report the average of duplicate tests as the percentage weight of grease washed out at the test temperature, and indicate the temperature at which the bearing assembly and grease were dried.

10. Precision and Bias⁵

10.1 The precision of this test method was obtained using **ADJD6300** (D2PP).³

10.2 The precision of this test method was determined by drying the bearing assembly and grease at 77 °C (170 °F). The precision statement does not apply to samples which are dried at the higher temperatures given in **Note 6**.

10.3 *Repeatability*—The difference between successive 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.

Repeatability

$$\begin{array}{ll} 38^\circ\text{C} & r = 0.8 (X + 2) \\ 79^\circ\text{C} & r = 0.6 (X + 4.6) \end{array}$$

where: X is the average of two results in %.

10.3.1 *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, exceed the following values only in one case in twenty.

Reproducibility

$$\begin{array}{ll} 38^\circ\text{C} & R = 1.4 (X + 2) \\ 79^\circ\text{C} & R = 1.1 (X + 4.6) \end{array}$$

where: X is the average of two results in %.

10.4 *Bias*—The procedure in this test method has no bias because the value of grease washout can be defined only in terms of a test method.

11. Keywords

11.1 grease; washout; water

SUMMARY OF CHANGES

Subcommittee D02.G0 has identified the location of selected changes to this standard since the last issue (D1264 – 16) that may impact the use of this standard. (Approved Sept. 1, 2018.)

(1) Revised subsection 5.1.

(2) Revised subsection 7.1, adding reference to **Note 2** and a new **Note 3**.

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