



# Standard Test Method for Corrosion-Preventive Properties of Lubricating Greases in Presence of Dilute Synthetic Sea Water Environments<sup>1</sup>

This standard is issued under the fixed designation D 5969; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

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<sup>ε1</sup>Note—Corrected 6.3 and added inadvertently omitted items to the Summary of Changes editorially in August 2005. <sup>ε2</sup>Note—Editorially replaced Stoddard solvent with mineral spirits throughout to match approved change to 7.5 in December 2005.

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## 1. Scope\*

1.1 This test method covers the determination of the corrosion-preventive properties of greases using grease-lubricated tapered roller bearings exposed to various concentrations of dilute synthetic sea water stored under wet conditions. It is based on Test Method D 1743, which is practiced using a similar procedure and distilled water. The reported result is a pass or fail rating as determined by at least two of three bearings.

1.2 *Apparatus Dimensions*—The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *All Other Values*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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 and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

D 665 Test Method for Rust-Preventing Characteristics of Inhibited Mineral Oil in the Presence of Water

D 1193 Specification for Reagent Water

D 1743 Test Method for Determining Corrosion Preventive Properties of Lubricating Greases

## 3. Terminology

### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *corrosion*—the chemical or electrochemical reaction between a material, usually a metal, and its environment that produces a deterioration of the material and its properties.

3.1.1.1 *Discussion*—In this test method, corrosion is manifested by red rust or black stains on the bearing race. Stains, through which the underlying metal surface is still visible, are not considered corrosion in Test Method D 5969 and shall be ignored.

**D 1743**

## 4. Summary of Test Method

4.1 New, cleaned, and lubricated bearings are run under a light thrust load for  $60 \pm 3$  s to distribute the lubricant in a pattern that might be found in service. The bearings are exposed to a solution of synthetic sea water at some percentage in distilled water, then stored for  $24 \pm \frac{1}{2}$  h at  $52 \pm 1^\circ\text{C}$  and 100 % relative humidity. After cleaning, the bearing cups are examined for evidence of corrosion.

## 5. Significance and Use

5.1 This test method differentiates the relative corrosion-preventive capabilities of lubricating greases under the test conditions.

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<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.G0.06 on Lubricating Grease—Functional Tests - Contamination.

Current edition approved June Dec. 1, 2005:2008. Published July 2005:January 2009. Originally approved in 1996. Last previous edition approved in 2002:2005 as D 5969-05<sup>ε2</sup>.

<sup>2</sup> 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.

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

**6. Apparatus**

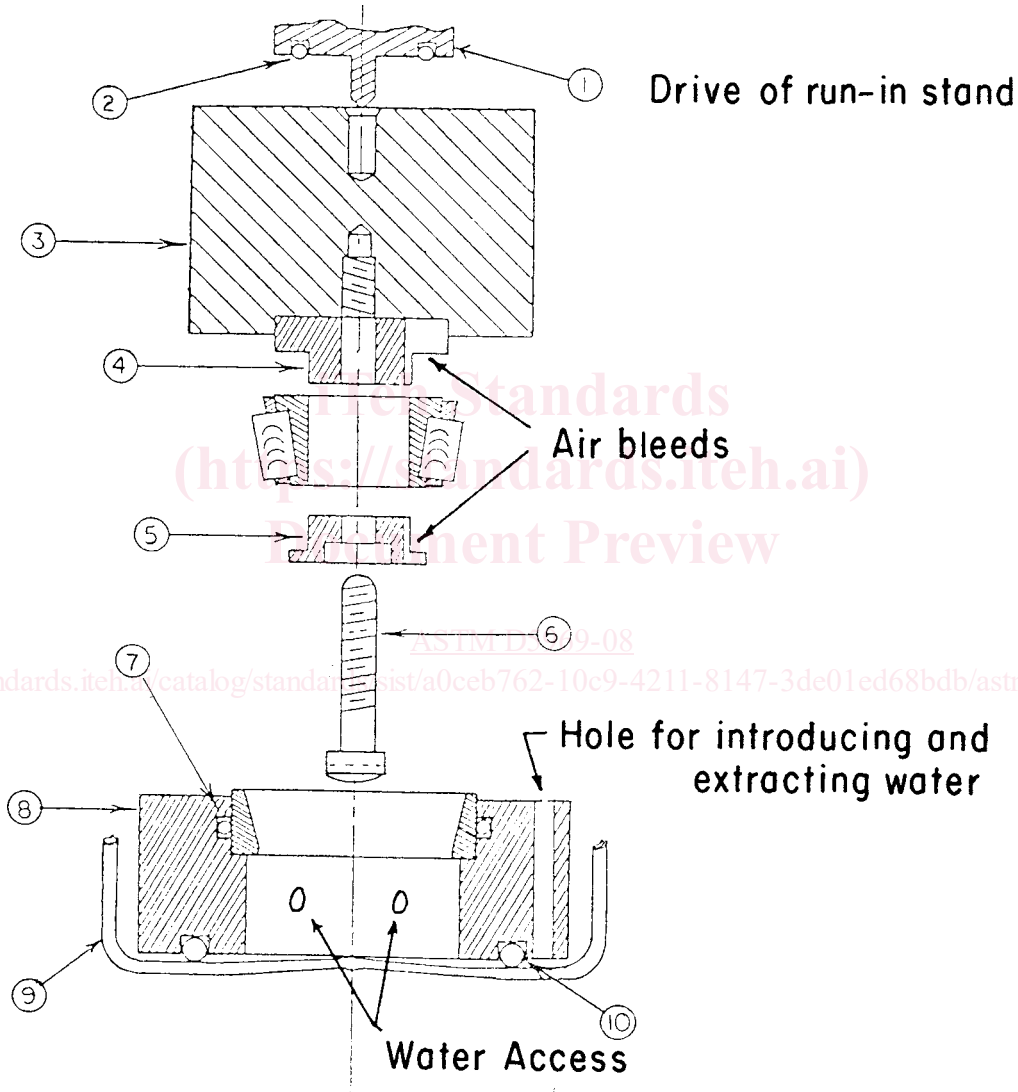
6.1 *Bearings*, Timken bearing cone and roller assembly LM11949 and cup LM11910.<sup>3</sup>

6.2 *Motor*, 1750-rpm (approximate) speed, 1/15 hp (min).

6.3 *Bearing Holder*, (see Fig. 1) consists of a 1 ± 0.01-kg mass, upper and lower plastic collars for the bearing cone (Parts A and B), a metal screw, and a plastic collar for the cup (Part C).

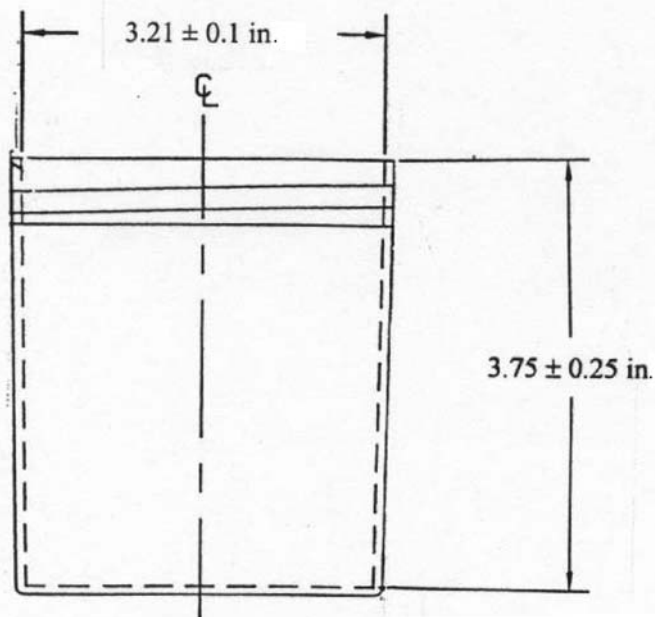
6.4 *Plastic Test Jar*, as shown in Fig. 2.

<sup>3</sup> Manufactured by the Timken Co., Canton, OH 44706.



KEY	DESCRIPTION	QUANTITY
1	PISTON	1
2	O RING	1
3	WEIGHT	1
4	UPPER FLANGE	1
5	LOWER FLANGE	1
6	1/4 - 20 × 1-1/4 FILLISTER HD. MACH. SCREW S.S.	1
7	O RING	1
8	BEARING HOLDER	1
9	PLASTIC JAR	1
10	O RING	1

**FIG. 1 Test Method D 1743 Bearing Holder Assembly**



Test Jar Specifications  
 Inner Diameter Range: 3.11–3.31 in. (79–84 mm)  
 Inner Height Range: 3.5–4.0 in. (89–102 mm)

FIG. 2 Plastic Test Jar

- 6.5 *Run-in Stand*,<sup>4</sup> as shown in Fig. 3.
- 6.6 *Spindle/Thrust Loading Device*,<sup>3</sup> as shown in Fig. 4.
- 6.7 *Mechanical Grease Packer*, as shown in Fig. 5.
- 6.8 *Pliers*,<sup>5</sup> as shown in Fig. 6.
- 6.9 *Syringe*, of at least 100 ± 5 mL volume and with a needle of at least 16 gauge and a minimum length of 100 mm (4 in.).
- 6.10 *Timer*, capable of measuring a 60 ± 3-s interval.
- 6.11 *Oven*, a laboratory oven, essentially free of vibration, capable of maintaining 52 ± 1°C.

## 7. Reagents

7.1 *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.<sup>6</sup> Other grades may be used, provided that it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

7.2 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean reagent water conforming to Specification D 1193, Type III.

7.3 *Isopropyl Alcohol*. (**Warning**—Flammable.)

7.4 *Solvent Rinse Solution*, of the following composition by volume:

7.4.1 *Isopropyl Alcohol*, 90 %,

7.4.2 *Distilled Water*, 9 %, and

7.4.3 *Ammonium Hydroxide*, 1 %. (**Warning**—Poison. Causes burns. Vapor extremely irritating. May be fatal if swallowed. Harmful if inhaled.)

7.5 *Mineral Spirits*, reagent grade, minimum purity. (**Warning**—Combustible. Vapor harmful.)

7.6 *Synthetic Sea Water*, prepared as described in Test Method D 665. (**Warning**—Poison. May be fatal if swallowed.)

## 8. Standardization of Thrust Loading Device

8.1 Pack a bearing, and install it into the holder. Place the assembly into a plastic jar as described in 10.1-10.4. Place the jar

<sup>4</sup> The sole source of supply of the apparatus known to the committee at this time is Falex Corp., 1020 Airpark Drive, Sugar Grove, IL, 60554. 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, which you may attend.

<sup>5</sup> A Waldes Truarc Plier No. 4, available from Truarc Co., or similar, modified as in Fig. 5.

<sup>6</sup> *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.

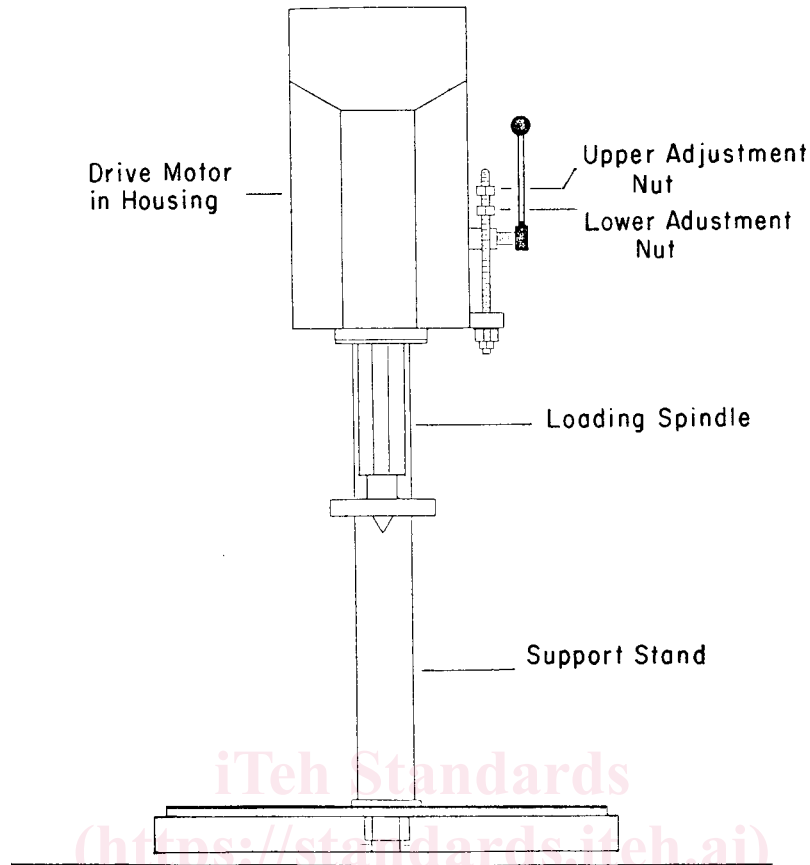


FIG. 3 Run-in Stand Drawing

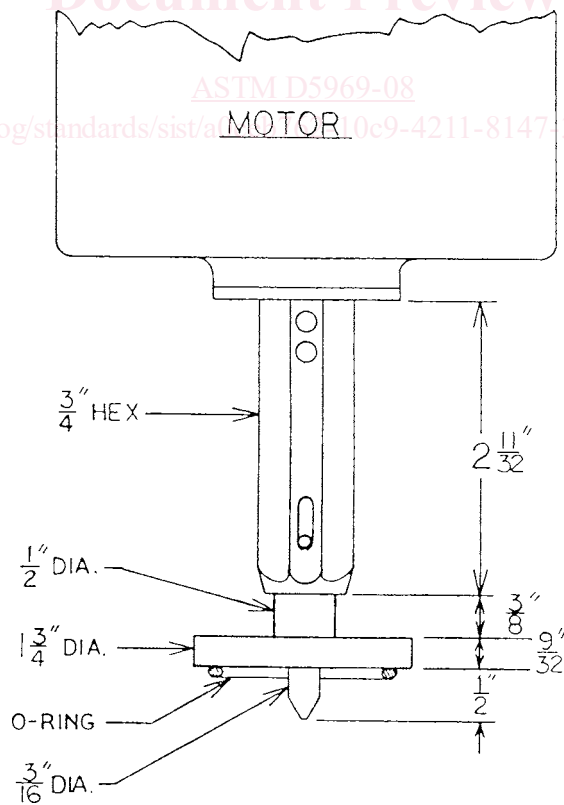


FIG. 4 Spindle/Thrust Loading Device