



# 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.

## 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 The values stated in acceptable inch-pound units for the apparatus dimensions are to be regarded as standard, and the SI conversions are provided for information only. All other values stated in acceptable SI units are 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 and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:

- D 235 Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvents)<sup>2</sup>
- D 665 Test Method for Rust-Preventing Characteristics of Inhibited Mineral Oil in the Presence of Water<sup>3</sup>
- D 1193 Specification for Reagent Water<sup>4</sup>
- D 1743 Test Method for Determining Corrosion Preventive Properties of Lubricating Greases<sup>3</sup>

## 3. Terminology

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

3.1.1 *corrosion*—red rust or black spots on the race. Stains, through which the underlying metal surface is still visible, shall be ignored.

## 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.

## 6. Apparatus

6.1 *Bearings*, Timken bearing cone and roller assembly LM11949 and cup LM11910.<sup>5</sup>

6.2 *Motor*, 1750-rpm (approximate) speed,  $\frac{1}{4}$  hp.

6.3 *Bearing Holder*,<sup>6</sup> (see Fig. 1) consists of a 1-kg mass, upper and lower plastic collars for the bearing cone (Parts A and B), a metal screw, a plastic collar for the cup (Part C), and a plastic jar with a screw cap.

6.4 *Run-in Stand*,<sup>6</sup> as shown in Fig. 2.

6.5 *Spindle/Thrust Loading Device*,<sup>5</sup> as shown in Fig. 3.

6.6 *Mechanical Grease Packer*, as shown in Fig. 4 and Fig. 5.

6.7 *Pliers*,<sup>7</sup> as shown in Fig. 5.

6.8 *Syringe*, of at least  $100 \pm 5$  mL volume and with a needle of at least 16 gage and a minimum length of 100 mm (4 in.).

6.9 *Timer*, capable of measuring a  $60 \pm 3$ -s interval.

6.10 *Oven*, a laboratory oven, essentially free of vibration, capable of maintaining  $52 \pm 1^\circ\text{C}$ .

## 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,

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.02 on Lubricating Grease.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 06.04.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 05.01.

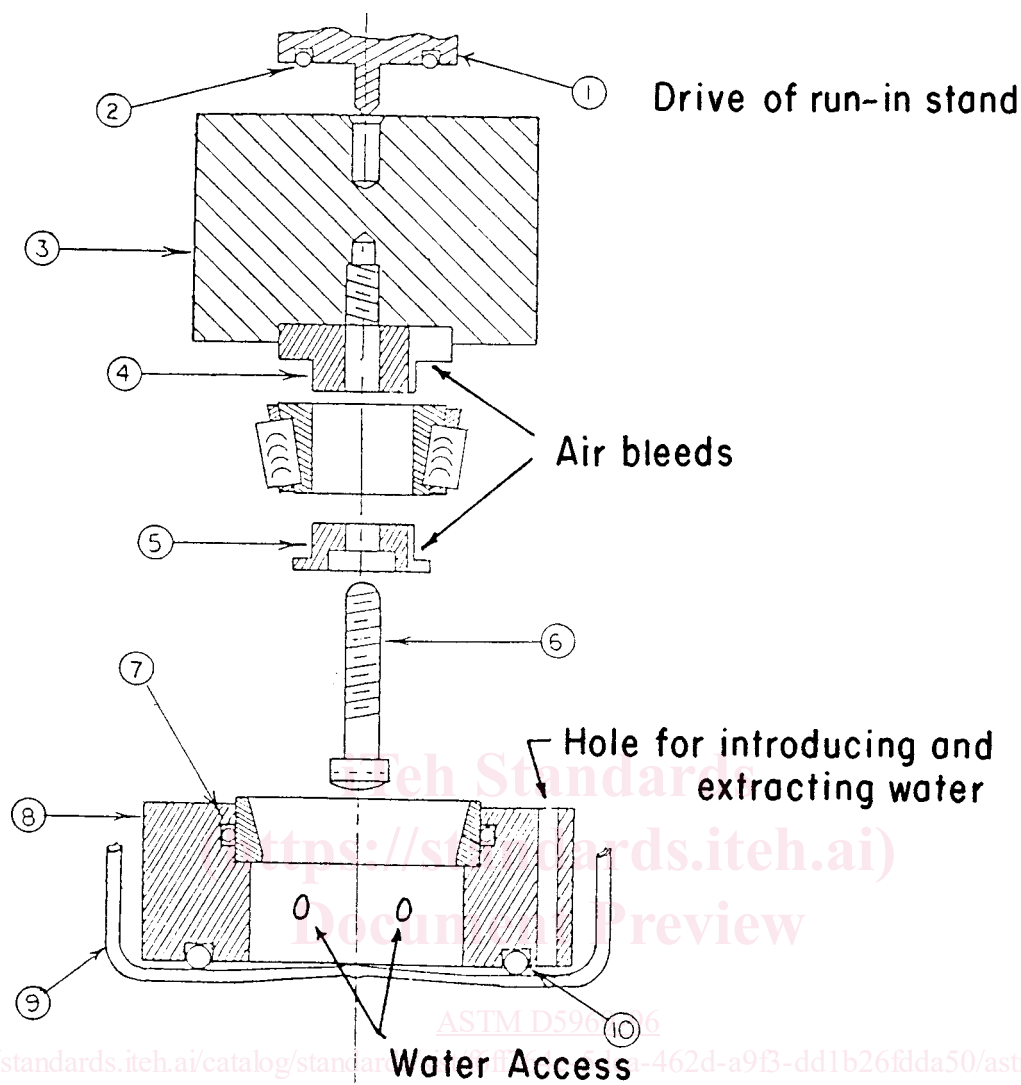
<sup>4</sup> *Annual Book of ASTM Standards*, Vol 11.01.

<sup>5</sup> Manufactured by the Timken Co., Canton, OH 44706.

<sup>6</sup> This equipment is available from Falex Corp., 2055 Comprehensive Dr., Aurora, IL 60505.

<sup>7</sup> A Waldes Truarc Plier No. 4, available from Truarc Co., or similar, modified as in Fig. 5.

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KEY	DESCRIPTION	QUANTITY
1	PISTON	1
2	O RING	1
3	WEIGHT	1
4	UPPER FLANGE	1
5	LOWER FLANGE	1
6	¼ - 20 × 1-¼ 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**

where such specifications are available.<sup>8</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.

<sup>8</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 *Analar 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.

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*.

NOTE 1—**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 %.

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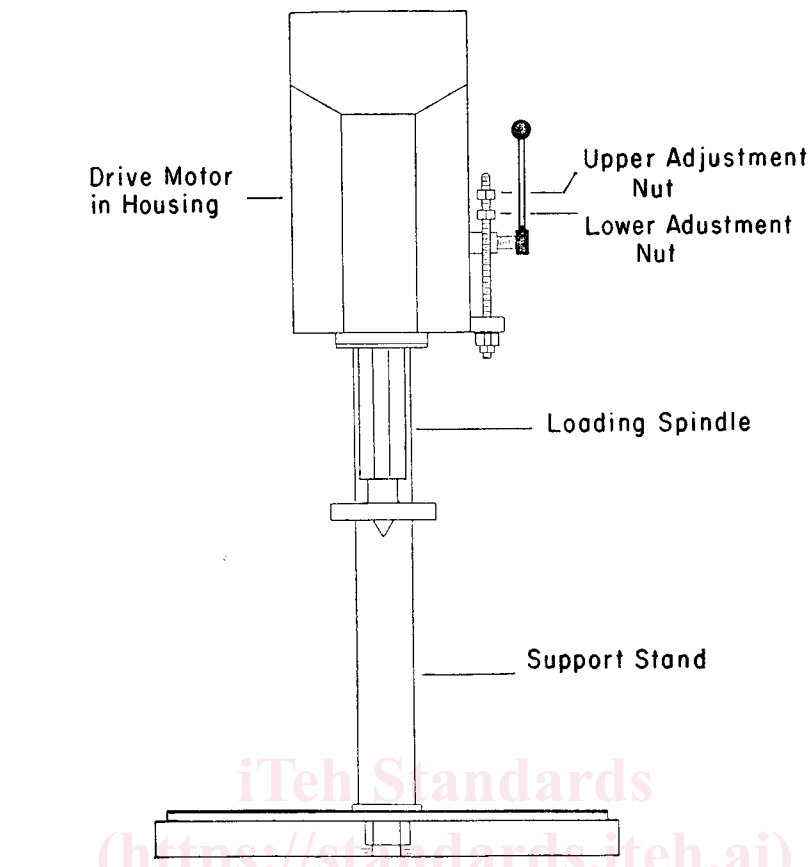


FIG. 2 Run-in Stand Drawing

NOTE 2—**Warning:** Poison. Causes burns. Vapor extremely irritating. May be fatal if swallowed. Harmful if inhaled.

7.5 *Stoddard Solvent*, as described in Specification D 235.

NOTE 3—**Warning:** Combustible. Vapor harmful.

7.6 *Synthetic Sea Water*, prepared as described in Test Method D 665.

NOTE 4—**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 onto the base of the motor drive spindle and center it under the indexing pin of the drive. Lower the drive until the O-ring just contacts the 1-kg weight. Run the bottom nut of the depth gage (see Fig. 2) down to the stop. Place a 3-mm spacer on top of this nut. Bring the top nut down to the spacer. While holding the top nut in position, remove the spacer and run the bottom nut up and tighten it against the top nut. When the O-ring is compressed against the 1-kg weight until the adjustment nut hits the stop, there will be a 29-N load added, giving a total load of 39 N on the bearing. (The loads described are provided by the forces of the spring in the thrust loading spindle and the sum of the 1-kg weight and spring, respectively. These loads are approximate. The 1-kg weights should be within 0.010 kg of their stated values. The thrust loading spindle should be calibrated by some suitable method when it is first put into service, recalibrated periodically, and replaced if its spring

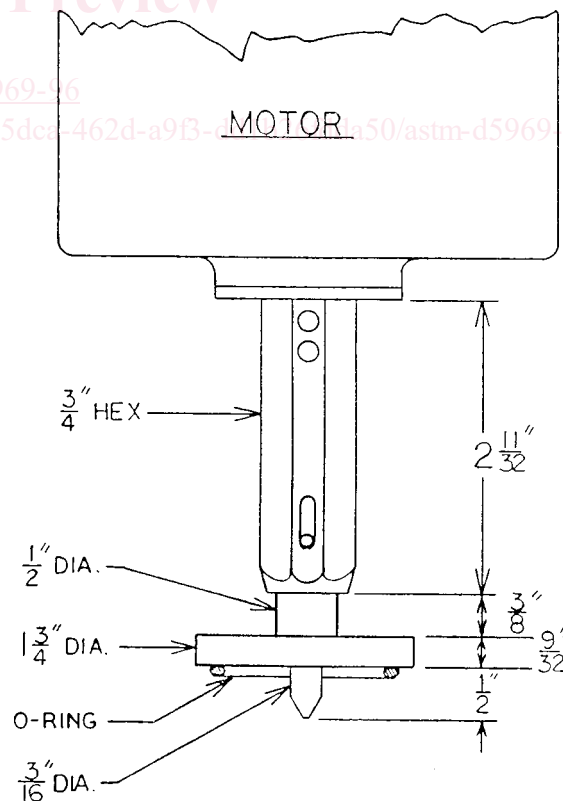


FIG. 3 Spindle/Thrust Loading Device