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.

Designation: G137 – 24

Standard Test Method for Ranking Resistance of Plastic Materials to Sliding Wear Using a Block-On-Ring Configuration[1]

This standard is issued under the fixed designation G137; 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.

1. Scope

1.1 This test method covers a laboratory procedure to measure the resistance of plastic materials under dry sliding conditions. The test utilizes a block-on-ring geometry to rank materials according to their sliding wear characteristics under various conditions.

1.2 The test specimens are small so that they can be molded or cut from fabricated plastic parts. The test may be run at the load, velocity, and temperature which simulate the service condition.

1.3 Wear test results are reported as specific wear rates calculated from volume loss, sliding distance, and load. Materials with superior wear resistance have lower specific wear rates.

1.4 This test method allows the use of both single- and multi-station apparatus to determine the specific wear rates.

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

1.6 *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.*

1.7 *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]

D618 Practice for Conditioning Plastics for Testing

D3702 Test Method for Wear Rate and Coefficient of Friction of Materials in Self-Lubricated Rubbing Contact Using a Thrust Washer Testing Machine

E122 Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process

G40 Terminology Relating to Wear and Erosion

G77 Test Method for Ranking Resistance of Materials to Sliding Wear Using Block-on-Ring Wear Test

G117 Guide for Calculating and Reporting Measures of Precision Using Data from Interlaboratory Wear or Erosion Tests (Withdrawn 2016)[3]

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminology G40.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *specific wear rate, n*—the volume loss per unit sliding distance, divided by the load; it can be calculated as the volume loss per unit time, divided by the load and the sliding velocity.

3.2.2 *steady state specific wear rate, n*—the specific wear rate that is established during that part of the test when the specific wear rate remains substantially constant (the specific wear rate versus sliding distance curve flattens out considerably with less than 30 % difference between the specific wear rates) during a minimum of three time intervals spanning a total time duration of at least 18 h, with ideally no single

[1] This test method is under the jurisdiction of ASTM Committee G02 on Wear and Erosion and is the direct responsibility of Subcommittee G02.40 on Non-Abrasive Wear.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

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interval exceeding 8 h; however, one time interval during the steady state can be as long as 16 h.

4. Summary of Test Method

4.1 A plastic block of known dimensions is brought into contact with a counterface ring (usually metal) under controlled conditions of contact pressure and relative velocity. This is achieved using a block-on-ring configuration as illustrated in Fig. 1. Periodic weighing of the polymer block results in a number of mass-time data points where the time relates to the time of sliding. The test is continued until the steady state wear rate is established. Mass loss measurements made after the steady state is established are used to determine the steady state specific wear rate, which is the volume loss per unit sliding distance per unit load. The frictional torque may also be measured during the steady state using a load cell. These data can be used to evaluate the coefficiency of friction for the test combination.

NOTE 1—Another test method that utilizes a block-on-ring test configuration for the evaluation of plastics is Test Method G77.

5. Significance and Use

5.1 The specific wear rates determined by this test method can be used as a guide in ranking the wear resistance of plastic materials. The specific wear rate is not a material property and will therefore differ with test conditions and test geometries. The significance of this test will depend on the relative similarity to the actual service conditions.

5.2 This test method seeks only to describe the general test procedure and the procedure for calculating and reporting data.

NOTE 2—This test configuration allows steady state specific wear rates to be achieved very quickly through the use of high loads and speeds. The thrust washer configuration described in Test Method D3702 does not allow for the use of such high speeds and loads because of possible overheating (which may cause degradation or melting, or both) of the specimen. Despite the differences in testing configurations, a good correlation in the ranking of wear resistance is achieved between the two tests (Table X2.1).

6. Apparatus and Materials

6.1 *Test Setup*—An example of the basic test configuration and part names are shown in Fig. 1. The recommended dimensions of the test apparatus are shown in Fig. 2. The figures shown in this test method represent one example of a block-on-ring test apparatus. The mandatory elements are: the capability to change load and sliding speed, the ability to reposition the specimen after weighing as before, and a counterface ring with acceptable eccentricity. All other design elements can be varied according to the user preference.

6.1.1 Bearings recommended for counterface drive shafts are industrial-grade tapered roller bearings.

6.1.2 Required centerline alignment limits of the counterface drive shafts are ±0.41 mm (±0.016 in.) from the center of

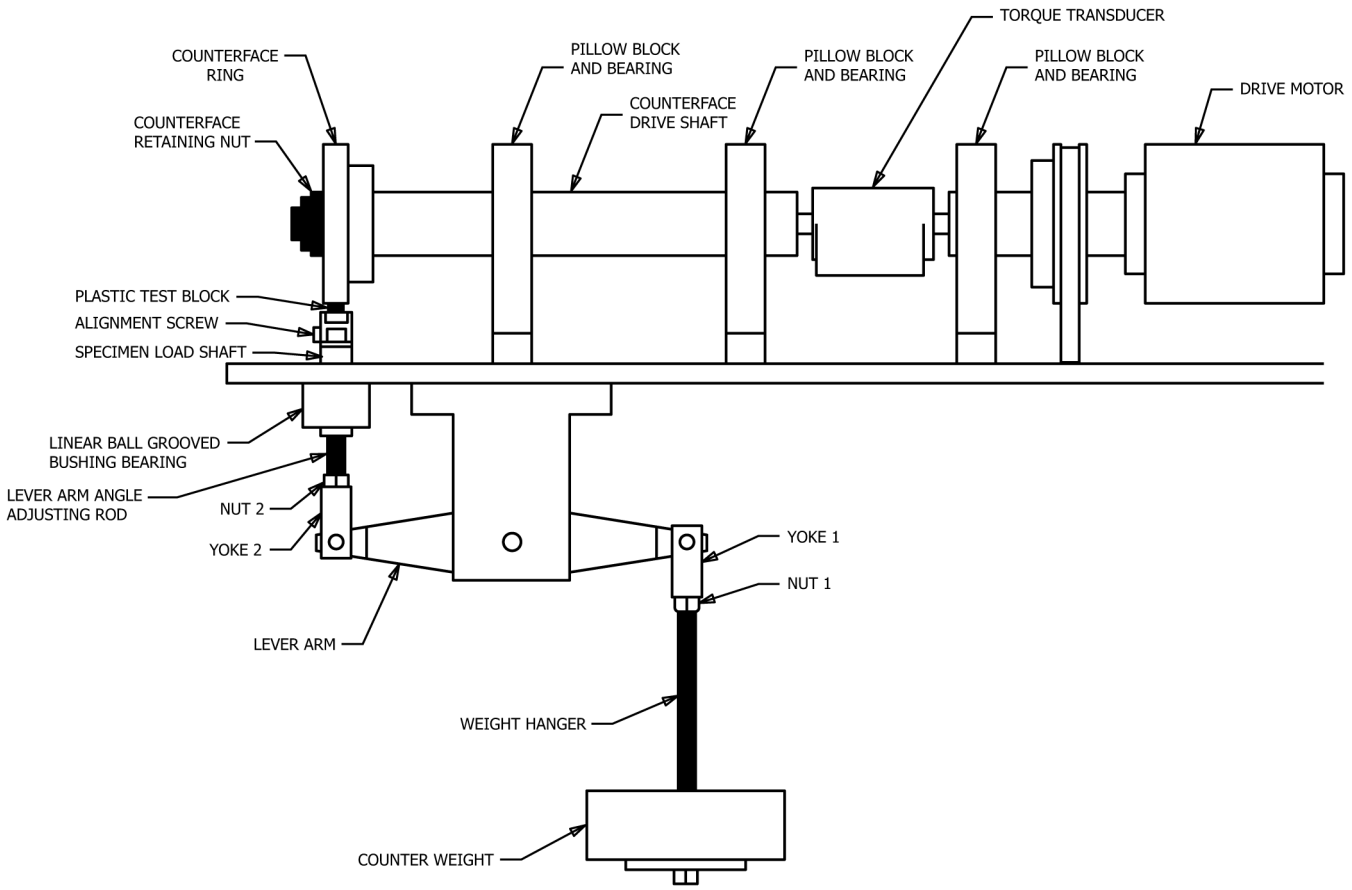

FIG. 1 Single Station Block-on-Ring Arrangement