



Designation: G 133 – 95 (Reapproved 2002)^{€1}

Standard Test Method for Linearly Reciprocating Ball-on-Flat Sliding Wear¹

This standard is issued under the fixed designation G 133; 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} NOTE—The final sentence in Footnote 4 was removed editorially July 2002.

1. Scope

1.1 This test method describes laboratory procedures for determining the sliding wear of ceramics, metals, and other candidate wear-resistant materials using a linear, reciprocating ball-on-flat plane geometry. The direction of the relative motion between sliding surfaces reverses in a periodic fashion such that the sliding occurs back and forth and in a straight line. The principal quantities of interest are the wear volumes of the contacting ball and flat specimen materials; however, the coefficient of kinetic friction may also be measured using the method described. This test method encompasses both unlubricated and lubricated testing procedures. The scope of this test method does not include testing in corrosive or chemically aggressive environments.

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.*

2. Referenced Documents

2.1 ASTM Standards:

E 112 Test Methods for Determining Average Grain Size²

E 1181 Test Methods for Characterizing Duplex Grain Sizes²

G 40 Terminology Relating to Erosion and Wear³

G 99 Test Method for Wear Testing with a Pin-on-Disk Apparatus³

G 115 Guide for Measuring and Reporting Friction Coefficients³

G 117 Guide for Calculating and Reporting Measures of Precision Using Data from Interlaboratory Wear or Erosion Tests³

G 118 Guide for Recommended Data Format of Sliding Wear Data Suitable for Databases³

3. Terminology

3.1 *Definitions*—Definitions used in this test method are given in Terminology G 40. The following definitions of important terms used in this test method are cited from Terminology G 40.

3.1.1 *friction force*—the resisting force tangential to the interface between two bodies when, under the action of an external force, one body moves or tends to move relative to the other.

3.1.2 *Hertzian contact pressure*—the magnitude of the pressure at any specified location in a Hertzian contact area, as calculated from Hertz's equations of elastic deformation.

3.1.3 *wear*—damage to a solid surface, generally involving the progressive loss of material, due to relative motion between that surface and a contacting surface or surfaces.

3.1.4 *wear rate*—the rate of material removal or dimensional change due to wear per unit of exposure parameter, for example, quantity removed (mass, volume, thickness) in unit distance of sliding or unit time.

4. Summary of Test Method

4.1 This test method involves two specimens—a flat specimen and a spherically ended specimen (herein called the “ball” specimen) which slides against the flat specimen. These specimens move relative to one another in a linear, back and forth sliding motion, under a prescribed set of conditions.

4.2 In this test method, the load is applied vertically downward through the ball specimen against the horizontally mounted flat specimen. The normal load, stroke length, frequency and type of oscillation, test temperature, lubricant (if any), test duration, and atmospheric environment (including relative humidity range) are selected from one of two procedures.

4.3 Since this test method involves reciprocating sliding where changes in the sliding velocity and direction of motion occur during the test, constant velocity conditions are not maintained. The manner in which the velocity varies with time is determined by the design of the mechanism which drives the ball or flat specimen back and forth.

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 *Annual Book of ASTM Standards*, Vol 03.01.

³ *Annual Book of ASTM Standards*, Vol 03.02.