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Standard Guide for Digital Data Acquisition in Wear and Friction Measurements¹

This standard is issued under the fixed designation G163; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This guide covers the providing of general guidance in applying hardware and software to digitally acquire wear and friction data in laboratory test systems. It points out important considerations in such data acquisition. It does not make specific recommendations or discuss specific details regarding commercial hardware or software.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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*:²

[G40 Terminology Relating to Wear and Erosion](#)

[G77 Test Method for Ranking Resistance of Materials to Sliding Wear Using Block-on-Ring Wear Test](#)

[G83 Test Method for Wear Testing with a Crossed-Cylinder Apparatus \(Withdrawn 2005\)](#)³

[G99 Test Method for Wear Testing with a Pin-on-Disk Apparatus](#)

[G115 Guide for Measuring and Reporting Friction Coefficients](#)

[G118 Guide for Recommended Format of Wear Test Data Suitable for Databases](#)

3. Terminology

3.1 *Definitions*:

¹ This guide is under the jurisdiction of ASTM Committee G02 on Wear and Erosion and is the direct responsibility of Subcommittee G02.20 on Data Acquisition in Tribosystems.

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² 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.

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

3.1.1 *coefficient of friction, n*—the dimensionless ratio of the friction force between two bodies to the normal force pressing the bodies together.

3.1.2 *wear, n*—alteration of a solid surface by progressive loss or progressive displacement of material due to relative motion between that surface and a contacting substance or substances. **G40**

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *hardware, n*—mechanical and electronic components in instrumentation used to acquire data.

3.2.2 *software, n*—computer code that can be executed to control hardware systems and store data.

4. Summary of Guide

4.1 Several important issues relating to digital data acquisition in wear and friction measurements are identified and explained. Hardware and software choices are described in general terms, along with some important considerations in data storage.

5. Significance and Use

5.1 This guide illustrates the steps and considerations involved with digital data acquisition. While analog recording of wear and friction data has been in the past, digital data acquisition and storage is used extensively. It is important that DAQ users understand how data is collected and stored and how data manipulation may affect raw data integrity.

5.2 Multi-station wear and friction testing is increasing in use, and because of the increased volume of data in such approaches, the use of digital data acquisition facilitates such testing.

5.3 The same hardware and software used for the initial analog data conversion to digital form can often also be used for initial data processing, for example, multiple-point averaging. This can conveniently lead to computer-based storage of processed data in digital form. However, where possible, the storage of unfiltered (software filters) and unmanipulated data will allow reevaluation of original data should calibration coefficients need to be adjusted.

5.4 Databases are frequently constructed in computerized format (see Guide G118) in order to hold large amounts of wear and friction data from laboratory test programs.