



# Standard Guide for Recommended Format of Wear Test Data Suitable for Databases<sup>1</sup>

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## 1. Scope

1.1 This guide is intended to assist in the organization of wear test data for the purpose of data storage in computerized databases. It is meant to assist the user in developing databases for the purpose of data comparison and utilization. Data elements (fields) are described covering both materials and wear test issues.

## 2. Referenced Documents

### 2.1 ASTM Standards:

- E 527 Practice for Numbering Metals and Alloys (UNS)<sup>2</sup>
- E 1314 Practice for Structuring Terminological Records Relating to Computerized Test Reporting and Materials Designation Formats<sup>3</sup>
- E 1338 Guide for the Identification of Metals and Alloys in Computerized Material Property Databases<sup>3</sup>
- G 40 Terminology Relating to Wear and Erosion<sup>4</sup>
- G 65 Test Method for Measuring Abrasion Using the Dry Sand/Rubber Wheel Apparatus<sup>4</sup>
- G 75 Test Method for Determination of Slurry Abrasivity (Miller Number) and Slurry Abrasion Response of Materials (SAR Number)<sup>4</sup>
- G 77 Test Method for Ranking Resistance of Materials to Sliding Wear Using Block-on-Ring Wear Test<sup>4</sup>
- G 83 Test Method for Wear Testing with a Crossed-Cylinder Apparatus<sup>4</sup>
- G 99 Test Method for Wear Testing with a Pin-on-Disk Apparatus<sup>4</sup>
- G 105 Test Method for Conducting Wet Sand/Rubber Wheel Abrasion Tests<sup>4</sup>
- G 115 Guide for Measuring and Reporting Friction Coefficients<sup>4</sup>
- G 132 Test Method for Pin Abrasion Testing<sup>4</sup>

### 2.2 ANSI Standard:

- B 46.1.85 Surface Texture, Surface Roughness, Waviness<sup>5</sup>

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<sup>2</sup> Annual Book of ASTM Standards, Vol 01.01.

<sup>3</sup> Annual Book of ASTM Standards, Vol 14.01.

<sup>4</sup> Annual Book of ASTM Standards, Vol 03.02.

<sup>5</sup> Available from ANSI, 11 W. 42nd St., 13th Floor, New York, NY 10036.

## 3. Terminology

3.1 *Definitions*—For definitions of some terms applicable to this guide, see Practice E 1314 and Terminology G 40.

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

3.2.1 *class*—a major material class, for example, metal, ceramic, polymer, etc.

3.2.2 *common name*—a name frequently given to a particular material, for example, nylon.

3.2.3 *contact environment*—terms describing the environment at the contact, for example, atmosphere, humidity, gases present, and so forth.

3.2.4 *form*—the material form, for example, rod, sheet, and cast.

3.2.5 *grade*—designation given a material by a manufacturer.

3.2.6 *hardness*—the usual methods for hardness determinations include Rockwell C, Vickers, etc. Load should be specified.

3.2.7 *processing treatment*—a descriptive phrase on the process method, for example, casting, hardening, and conditions, for example, time, temperature.

3.2.8 *specification*—a precise statement of a set of requirements to be satisfied by a material, promulgated by an organization, for example, ASTM, SAE, etc.

3.2.9 *specimen shape*—the shape of the test specimen, for example, block, pin.

3.2.10 *standard test specification*—test designation, that is, ASTM, SAE, etc. (Note that the test must conform to the standard if so designated.)

3.2.11 *subclass*—subdivisions of a class, for example, ferrous, boride, etc.

## 4. Summary of Guide

4.1 This guide specifies a set of fields that form the basis of a format for organizing wear data for use in computerized databases. Sufficient information is provided in this guide to enable the user to construct a database structure suitable for an intended application involving wear. A set of essential fields in the database are identified. The user may also add or delete fields to customize the database format for any particular application.

## 5. Significance and Use

5.1 This guide can be used to facilitate categorizing wear

data for insertion into a computerized database. This guide identifies a set of essential data fields which should be provided for all records, and also identifies additional optional data fields. This guide does not require the use of any particular database format, nor does it endorse any particular computer database software.

5.2 Because of increased activity in building computerized databases and the desire to encourage their uniformity and therefore the ease of data comparison and data interchange, it is appropriate to provide a guide for the inclusion of wear test data in databases. Availability of a guide also encourages the builders of databases to include sufficiently complete information so that comparisons among individual sources may be made with assurance that similarities or differences, or both, in the wear test procedures and conditions are covered.

5.3 The set of data fields described in this guide will usually be expanded and customized by the user for specific purposes. It should be possible to arrange the additional fields within the logical structure that is presented in this guide.

5.4 This guide does not apply to data from rolling contact wear tests, galling tests, or erosion or cavitation tests. Data that are included should apply to standard tests or to steady-state wear.

5.5 This guide has no implication on data required for materials production or purchase. Reporting of actual test results should be as described in the actual material specification or as agreed upon between the purchaser and the manufacturer, as shown on the purchase order and acknowledgment.

## 6. Data Categorization

6.1 Seven general categories of data are identified for use with wear databases, as follows:

6.1.1 *Test Identification*—Coded information that describes the test, for example, test number.

6.1.2 *Test Type*—Identification of the type of sliding wear test, for example, standardized (examples include Test Methods G 77, G 83, and G 99).

6.1.3 *Test Conditions*—Description of the exposure conditions, for example, test load.

**TABLE 1 Recommended Data Format for Sliding Wear Data**

Field No. <sup>A</sup>	Field Name or Description	Field Type or Unit <sup>B</sup>
Test Identification		
1.1 <sup>C</sup>	Individual test number	alphanumeric
1.2 <sup>C</sup>	Date of test	date
1.3 <sup>C</sup>	Testing organization	alphanumeric
Test Type		
2.1	Standard Test Specification	alphanumeric
2.2 <sup>C</sup>	Laboratory or Field test	(1) laboratory (2) field
2.3 <sup>C</sup>	Nature of sliding test	(1) non-lubricated (2) lubricated
2.4 <sup>C</sup>	Test machine description <sup>D</sup>	alphanumeric
Test Conditions		
3.1 <sup>C</sup>	Load conditions	(1) steady (2) variable
3.2 <sup>C</sup>	Load value	N
3.3	Pressure (nominal)	Pa
3.4 <sup>C</sup>	Velocity conditions	(1) steady (2) variable

Field No. <sup>A</sup>	Field Name or Description	Field Type or Unit <sup>B</sup>
3.5 <sup>C</sup>	Velocity value or range	m/s
3.6 <sup>C</sup>	Total sliding distance	m
3.7	Sliding distance per cycle	m
3.8 <sup>C</sup>	Test temperature	°C
3.9 <sup>C</sup>	Ambient temperature	°C
3.10 <sup>C</sup>	Type of motion	alphanumeric
3.11 <sup>C</sup>	Continuity of motion	alphanumeric
3.12 <sup>C</sup>	Contact environment description <sup>E</sup>	alphanumeric
3.13	Lubricated contact description <sup>F</sup>	alphanumeric
3.14	Abrasive contact description <sup>G</sup>	alphanumeric
3.15	Other test information	alphanumeric
Material Definitions (Specimen Pairs, A and B)		
4.1 <sup>C</sup>	Material class, A	alphanumeric
4.2 <sup>C</sup>	Material subclass, A	alphanumeric
4.3 <sup>C</sup>	Common name, A	alphanumeric
4.4 <sup>C</sup>	Grade designation, A	alphanumeric
4.5	Specification, A	alphanumeric
4.6	Form, A	alphanumeric
4.7	Processing treatment, A	alphanumeric
4.8	Composition: name, wt/vol %, A	alphanumeric
4.9	Additional description	alphanumeric
4.10	Hardness, A	number, scale
Material Definitions (Specimen Pairs, A and B)—Cont.		
4.11	Density, A	kg/m <sup>3</sup>
4.12 <sup>C</sup>	Material class, B	alphanumeric
4.13 <sup>C</sup>	Material subclass, B	alphanumeric
4.14 <sup>C</sup>	Common name, B	alphanumeric
4.15 <sup>C</sup>	Grade designation, B	alphanumeric
4.16	Specification, B	alphanumeric
4.17	Form, B	alphanumeric
4.18	Processing treatment, B	alphanumeric
4.19	Composition: name, wt/vol %, B	alphanumeric
4.20	Additional description	alphanumeric
4.21	Hardness, B	number, scale
4.22	Density, B	kg/m <sup>3</sup>
Specimen Identifications (Specimen Pairs, A and B)		
5.1 <sup>C</sup>	Specimen number or code, A	alphanumeric
5.2 <sup>C</sup>	Specimen shape, A	alphanumeric
5.3 <sup>C</sup>	Specimen dimensions, A	alphanumeric
5.4	Specimen surface texture, A	alphanumeric
5.5 <sup>C</sup>	Specimen number or code, B	alphanumeric
5.6 <sup>C</sup>	Specimen shape, B	alphanumeric
5.7 <sup>C</sup>	Specimen dimensions, B	alphanumeric
5.8	Specimen surface texture, B	alphanumeric
5.9	Specimen cleaning method	alphanumeric
5.10	Specimen surface production method	alphanumeric
Test Results		
6.1 <sup>C</sup>	Wear volume loss, A	mm <sup>3</sup>
6.2	Wear mass loss, A	g
6.3	Other wear measure, A	alphanumeric
6.4 <sup>C</sup>	Wear volume loss, B	mm <sup>3</sup>
6.5	Wear mass loss, B	g
6.6	Other wear measure, B	alphanumeric
6.7	Static friction coefficient	no units
6.8	Kinetic friction coefficient	no units
6.9	Comments on test	alphanumeric
Documentation		
7.1	Type of reference	(1) published (2) unpublished (3) technical committee report (4) other
7.2 <sup>C</sup>	Location of reference (citation)	alphanumeric

<sup>A</sup> Field numbers are for reference only. They do not imply a necessity to include all these fields in any specific database.

<sup>B</sup> If numeric, estimated values or ranges of values may be put in parenthetically if the actual values are not known.

<sup>C</sup> Denotes essential information for database construction.

<sup>D</sup> A thorough description of the test machine is important for valid comparisons of data from different machines. For examples of the information desired in such descriptions, see Test Methods G 77, G 83, G 99. Reference to published descriptions of the test machine is additionally desirable.

<sup>E</sup> A complete description of the contact environment is essential, for example, humidity level, gases present, and so forth.

<sup>F</sup> Indicate the type and describe the fluid present; describe any chemical additives present; for example: base oil: mineral, 110 cSt at 100°C viscosity; additives: VI improver, detergent, dispersant.

<sup>G</sup> Indicate the type of abrasive, grit size, or range, fixed or loose, bonding material, abrasive flow rate, fluids present, and so forth: for example: water slurry with 25 volume % AFS test sand, size - 50/ + 70 sieve size. (See Test Methods G 65, G 75, G 105, G 132 for details of abrasive tests). [Note—Wear debris is not to be described in this field.]

6.1.4 *Material Definition*—Information on the material pairs used in the test, for example, common names (background information is provided in Practice E 527 and Guide E 1338).

6.1.5 *Specimen Identification*—Detailed information on the test specimens, for example, size, surface texture (ANSI B 46.1.85).

6.1.6 *Test Results*—Listing of the numeric results of the test, for example, amount of wear, friction coefficient (see Guide G 115 for details of friction measurements).

6.1.7 *Documentation*—Identification of the location and type of documentation concerning the test data, for example, place of publication.

**7. Data Format**

7.1 A recommended format for wear test data is shown in Table 1. An example of the use of this format is shown in Appendix X1. There are three columns of information for each item, that is, each field name, as follows:

7.1.1 *Field Reference Number*—A number for each individual field within this format guideline. This number has no permanent value and does not become part of the database itself. The number is keyed to the set of categories presented in Section 6 of this guide.

7.1.2 *Field Name or Description*—The complete name of the field, descriptive of the information to be entered in this field of the database.

7.1.3 *Field Type*—There are three types of fields as described in the following:

7.1.3.1 *Category Sets*—Closed (complete) sets containing all possible (acceptable) inputs to the field.

7.1.3.2 *Alphanumeric*—Representative inputs to the field.

7.1.3.3 *Numeric*—The numeric value in the units listed.

7.2 The fields included in this format are those recommended to provide sufficiently complete information that users may be confident of their ability to compare sets of data from individual databases. This set of fields should make the database useful to a relatively broad range of users.

7.3 It is recognized that many databases are prepared for very specific applications, and individual database builders may elect to omit certain pieces of information considered to be of no value for that specific application. However, there are certain minimum number of fields considered essential to any database without which the user will not have sufficient information to reasonably interpret or compare the data. In the recommended format (Table 1), these fields are marked.

7.4 The presentation of this format does not represent a requirement that all of the elements included in the recommendation be appropriate for every database. Rather it is a guide to those elements that are likely to be useful to at least some users of most databases. It is understood that not all of the elements of information recommended for inclusion will be available in all databases. That fact should not discourage database builders and users from proceeding so long as the minimum essential information is included (the items marked). Blank fields are acceptable where the required information is not available.

**8. Keywords**

8.1 computer; data; database; format; wear

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**APPENDIXES**

(Nonmandatory Information)

**X1. EXAMPLE OF USE OF GUIDE FOR DATA FROM A CROSSED-CYLINDER WEAR TEST (TEST METHOD G 83)**

X1.1 Table X1.1 presents this information in tabular form.

**TABLE X1.1 Example of Use of Guide for Data from a Crossed-Cylinder Wear Test**

Test Identification		
1.1	Individual test number	RCC1092 1
1.2	Date of test	10-30-92
1.3	Testing organization	COMPANY, unit
Test Type		
2.1	Standard Test Specification	Test Method G 83
2.2	Laboratory or Field test	laboratory
2.3	Nature of sliding test	non-lubricated
2.4	Test machine description	NAME crossed-cyl in accordance with Test Method G 83
Test Conditions		
3.1	Load conditions	steady