



Designation: C808 – 75 (Reapproved 2021)

# Standard Guide for Reporting Friction and Wear Test Results of Manufactured Carbon and Graphite Bearing and Seal Materials<sup>1</sup>

This standard is issued under the fixed designation C808; 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 guide covers the following areas for reporting friction and wear test results of manufactured carbon and graphite bearing and seal materials:

1.1.1 Description of test device and techniques (Table 1 and Table 2.)

1.1.2 Description of carbon and graphite material test specimen (Table 3).

1.1.3 Description of mating member test specimen (Table 4).

1.1.4 Report of friction and wear test results (Table 5).

1.2 Many types of equipment and techniques will yield consistent data characterizing the friction and wear of carbon and graphite materials. However, the ranking of the materials by the various test methods used is not necessarily the same.

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.F0 on Manufactured Carbon and Graphite Products.

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This guide is an initial effort to promote more complete description of the test methods, whatever they may be. It is the eventual intent to identify one or more specific standard test methods when sufficient information becomes available.

1.3 *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. Significance and Use

2.1 The purpose of this guide is twofold. First, it is a research tool that will aid in the analysis and correlation of test results obtained on various test devices by different investigators. Second, it serves to identify important considerations that must be made in testing to make the results easily understood and comparable with the results of other investigators.

## 3. Keywords

3.1 carbon; friction; graphite; reporting; wear

**TABLE 1 Description of Test Device and Techniques**

	DATE _____
<b>1. DESCRIPTION OF TEST DEVICE</b>	
1.1 Preferred Designation, Manufacturer, and Modifications _____	
1.2 Orientation of Carbon Specimen Test Surface:	
1.2.1 Horizontal	<input type="checkbox"/>
1.2.2 Vertical	<input type="checkbox"/>
1.2.3 Other (describe)	_____
1.3 Description of Sliding:	
1.3.1 Linear	<input type="checkbox"/>
1.3.2 Rotational	<input type="checkbox"/>
1.3.3 Discontinuous motion	<input type="checkbox"/> Describe _____
1.3.4 Continuous motion	<input type="checkbox"/> Describe _____
1.3.5 Discontinuous contact	<input type="checkbox"/> Describe _____
1.3.6 Continuous contact	<input type="checkbox"/> Describe _____
1.3.7 Approximate duration of test	_____ minutes, _____ hours, _____ days
1.4 Description of Loading System:	
1.4.1 Maximum capacity	_____ N (_____ lbf)
1.4.2 Type of measuring element	_____
1.4.3 Type of recording device	_____
1.4.4 Estimate of error	_____
1.4.5 Calibration procedure and frequency	_____
1.5 Description of Speed-Measuring System:	
1.5.1 Maximum capacity	_____ m/s (_____ ft/s), _____ rev/min, other _____
1.5.2 Type of measuring element	_____
1.5.3 Type of recording device	_____
1.5.4 Estimate of error	_____
1.5.5 Calibration procedure and frequency	_____
1.6 Description of Temperature-Measuring System:	
1.6.1 Location (describe):	
1.6.1.1 Carbon test specimen	_____
1.6.1.2 Mating member test specimen	_____
1.6.1.3 Fluid (for example, upstream and downstream of test specimens and test cavity)	_____
1.6.2 Maximum value:	
1.6.2.1 Carbon test specimen	_____ K (_____ °F)
1.6.2.2 Mating member test specimen	_____ K (_____ °F)
1.6.2.3 Fluid	_____ K (_____ °F)
1.6.3 Type of measuring element:	
1.6.3.1 Carbon test specimen	_____
1.6.3.2 Mating member test specimen	_____
1.6.3.3 Fluid	_____
1.6.4 Type of recording device:	
1.6.4.1 Carbon test specimen	_____
1.6.4.2 Mating member test specimen	_____
1.6.4.3 Fluid	_____
1.6.5 Estimate of error:	
1.6.5.1 Carbon test specimen	_____
1.6.5.2 Mating member test specimen	_____
1.6.5.3 Fluid	_____
1.6.6 Calibration procedure and frequency:	
1.6.6.1 Carbon test specimen	_____
1.6.6.2 Mating member test specimen	_____
1.6.6.3 Fluid	_____
1.7 Description of Pressure-Measuring System Across Test Specimens:	
1.7.1 Maximum value:	
1.7.1.1 Upstream	_____ Pa absolute (_____ psia)
1.7.1.2 Downstream	_____ Pa absolute (_____ psia)
1.7.1.3 Differential	_____ Pa differential (_____ psid)
1.7.2 Type of measuring element:	
1.7.2.1 Upstream	_____
1.7.2.2 Downstream	_____
1.7.2.3 Differential	_____
1.7.3 Type of recording device:	
1.7.3.1 Upstream	_____
1.7.3.2 Downstream	_____
1.7.3.3 Differential	_____
1.7.4 Estimate of error:	
1.7.4.1 Upstream	_____
1.7.4.2 Downstream	_____
1.7.4.3 Differential	_____
1.7.5 Calibration procedure and frequency:	
1.7.5.1 Upstream	_____

**TABLE 2 Description of Test Device and Techniques** *Continued*

- 1.7.5.2 Downstream \_\_\_\_\_
- 1.7.5.3 Differential \_\_\_\_\_
- 1.8 *Description of Fluid Flow Rate Measuring Systems:*
- 1.8.1 Maximum value:
- 1.8.1.1 Across test specimens \_\_\_\_\_
- 1.8.1.2 Through test cavity \_\_\_\_\_
- 1.8.2 Type of measuring element:
- 1.8.2.1 Across test specimens \_\_\_\_\_
- 1.8.2.2 Through test cavity \_\_\_\_\_
- 1.8.3 Type of recording device:
- 1.8.3.1 Across test specimens \_\_\_\_\_
- 1.8.3.2 Through test cavity \_\_\_\_\_
- 1.8.4 Estimate of error:
- 1.8.4.1 Across test specimens \_\_\_\_\_
- 1.8.4.2 Through test cavity \_\_\_\_\_
- 1.8.5 Calibration procedure and frequency:
- 1.8.5.1 Across test specimens \_\_\_\_\_
- 1.8.5.2 Through test cavity \_\_\_\_\_
- 1.9 *Description of Friction-Measuring System:*
- 1.9.1 Maximum capacity \_\_\_\_\_ N ( \_\_\_\_\_ lbf), \_\_\_\_\_ N·m ( \_\_\_\_\_ lbf-ft), other \_\_\_\_\_
- 1.9.2 Type of measuring element \_\_\_\_\_
- 1.9.3 Type of recording device \_\_\_\_\_
- 1.9.4 Estimate of error \_\_\_\_\_
- 1.9.5 Calibration procedure and frequency \_\_\_\_\_

**2. METHOD OF FIXTURING CARBON TEST SPECIMEN**

- 2.1 Rigid
- 2.2 Pivot (1-D rotational freedom)
- 2.3 Swivel, Universal (2-D rotational freedom)
- 2.4 Hydraulic
- 2.5 Pneumatic
- 2.6 Misalignment \_\_\_\_\_ radians, other \_\_\_\_\_
- 2.7 Installed Eccentricity (TIR) \_\_\_\_\_ m ( \_\_\_\_\_ in.)
- 2.8 Axial Runout (TIR) \_\_\_\_\_ m ( \_\_\_\_\_ in.)
- 2.9 Radial Runout (TIR) \_\_\_\_\_ m ( \_\_\_\_\_ in.)

**3. METHOD OF FIXTURING MATING MEMBER**

- 3.1 Rigid
- 3.2 Pivot (1-D rotational freedom)
- 3.3 Swivel, Universal (2-D rotational freedom)
- 3.4 Hydraulic
- 3.5 Pneumatic
- 3.6 Misalignment \_\_\_\_\_ radians, other \_\_\_\_\_
- 3.7 Installed Eccentricity (TIR) \_\_\_\_\_ m ( \_\_\_\_\_ in.)
- 3.8 Axial Runout (TIR) \_\_\_\_\_ m ( \_\_\_\_\_ in.)
- 3.9 Radial Runout (TIR) \_\_\_\_\_ m ( \_\_\_\_\_ in.)

**4. ENVIRONMENTAL CONDITIONS**

- 4.1 *Carbon Test Specimen Conditioning Environment:*
- 4.1.1 Fluid medium: air  (specify moisture content \_\_\_\_\_), distilled water , deionized water , other (specify composition quantitatively) \_\_\_\_\_
- 4.1.2 Temperature \_\_\_\_\_ K ( \_\_\_\_\_ °F)
- 4.1.3 Pressure: ambient , other \_\_\_\_\_
- 4.1.4 Time at these conditions \_\_\_\_\_ minutes, \_\_\_\_\_ hours, \_\_\_\_\_ days
- 4.2 *Mating Member Test Specimen Conditioning Environment:*
- 4.2.1 Fluid medium: air  (specify moisture content \_\_\_\_\_), distilled water , deionized water , other (specify composition quantitatively) \_\_\_\_\_
- 4.2.2 Temperature \_\_\_\_\_ K ( \_\_\_\_\_ °F)
- 4.2.3 Pressure: ambient , other \_\_\_\_\_
- 4.2.4 Time at these conditions \_\_\_\_\_ minutes, \_\_\_\_\_ hours, \_\_\_\_\_ days
- 4.3 *Test Environment:*
- 4.3.1 Fluid medium:
- 4.3.1.1 Before test condition: air  (specify moisture content \_\_\_\_\_), distilled water , deionized water , other (specify composition quantitatively) \_\_\_\_\_
- 4.3.1.2 During test condition (specify how monitored and controlled, including limits) \_\_\_\_\_
- 4.3.1.3 After test condition (describe quantitatively, if possible, the change in composition or quality) \_\_\_\_\_
- 4.3.2 Substance other than fluid medium initially applied at test specimens interface (for example, lubricating oil) \_\_\_\_\_
- 4.3.3 Fluid temperature:
- 4.3.3.1 Upstream \_\_\_\_\_ K ( \_\_\_\_\_ °F)
- 4.3.3.2 Downstream \_\_\_\_\_ K ( \_\_\_\_\_ °F)
- 4.3.4 Fluid pressure:
- 4.3.4.1 Upstream \_\_\_\_\_ Pa absolute ( \_\_\_\_\_ psia)
- 4.3.4.2 Downstream \_\_\_\_\_ Pa absolute ( \_\_\_\_\_ psia)
- 4.3.4.3 Differential \_\_\_\_\_ Pa differential ( \_\_\_\_\_ psid)
- 4.3.5 Fluid flow through test cavity \_\_\_\_\_
- 4.3.6 Time to reach test conditions \_\_\_\_\_ minutes, \_\_\_\_\_ hours
- 4.3.7 Time at test conditions prior to test \_\_\_\_\_ minutes, \_\_\_\_\_ hours

**TABLE 3 Description of Carbon Test Specimen**

<b>1. DESCRIPTION OF CARBON MATERIAL</b>		
1.1 Manufacturer _____		
1.2 Grade Number _____		
1.3 Lot Number _____		
1.4 Raw Ingredients, if not Proprietary:		
1.4.1 Filler _____		
1.4.2 Binder _____		
1.4.3 Additives _____		
1.4.4 Impregnants _____		
1.4.5 Other _____		
1.5 Original Billet Forming Process _____		
1.6 Original Billet Size _____		
1.7 Heat Treatment, if not Proprietary:		
1.7.1 Graphitizing temperature _____ K ( _____ °F)		
1.7.2 Rate of heating _____ K/min( _____ °F/min)		
1.7.3 Soak time _____ minutes, _____ hours		
<b>2. DESCRIPTION OF TEST SPECIMEN</b>		
2.1 Location and Orientation in Original Billet _____		
2.2 Grain Size and Orientation in Test Specimen _____		
	<i>Before Test</i>	<i>After Test</i>
2.3 Microstructure (provide sketch or photo)	_____	_____
2.4 Surface Coating	_____	_____
2.5 Dimensions and Tolerances (provide print)	_____	_____
2.6 Test Surface Condition:		
2.6.1 Roughness (specify method used)	_____ μm aa	_____ μm aa
2.6.2 Waviness (specify method used)	_____	_____
2.6.3 Flatness (specify method used)	_____ μm	_____ μm
2.7 Hardness and Location Where Measured	_____	_____
2.8 Density and Method Used	_____	_____

**TABLE 4 Description of Mating Member Test Specimen**

<b>1. DESCRIPTION OF MATING MEMBER MATERIAL</b>		
1.1 Manufacturer _____		
1.2 Commercial Name _____		
1.3 Chemical Composition Limits _____		
1.4.1 Processing _____		
1.4.2 Heat treatment _____		
<b>2. DESCRIPTION OF TEST SPECIMEN</b>		
2.1 Location and Orientation in As-Received Piece _____		
2.2 Grain Size and Orientation in Test Specimen _____		
2.3 Microstructure: crystalline <input type="checkbox"/> , polycrystalline <input type="checkbox"/> , amorphous <input type="checkbox"/> , other _____ (provide sketch or photo)		
	<i>Before Test</i>	<i>After Test</i>
2.4 Dimension and Tolerances (provide print)	_____	_____
2.5 Test Surface Condition:		
2.5.1 Roughness (specify method used)	_____ μm aa	_____ μm aa
2.5.2 Waviness (specify method used)	_____	_____
2.5.3 Flatness (specify method used)	_____ μm	_____ μm
2.6 Hardness and Location Where Measured	_____	_____