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Standard Guideline for Reporting Friction and Wear Test Results of Manufactured Carbon and Graphite Bearing and Seal Materials¹

This standard is issued under the fixed designation C 808; 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 guideline 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. This guideline 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.

2. Significance and Use

2.1 The purpose of this guideline is two-fold. 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

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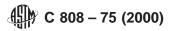


TABLE 1 Description of Test Device and Techniques

DATE	
1. DESCRIPTION OF TEST DEVICE	
1.1 Preferred Designation, Manufacturer, and Modifications	
1.2 Orientation of Carbon Specimen Test Surface: 1.2.1 Horizontal □ 1.2.2 Vertical □ 1.2.3 Other (describe)	
1.3 Description of Sliding: 1.3.1 Linear 1.3.2 Rotational 1.3.3 Discontinuous motion 1.3.4 Continuous motion 1.3.5 Discontinuous contact Describe	
1.3.6 Continuous contact Describe	
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	
1.6 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	
1.6.5.1 Carbon 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	
1.7 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	
1.7.2.3 Differential	
1.7.3 Type of recording device: 1.7.3.1 Upstream	
1.7.3.2 Downstream	
1.7.3.3 Differential	
1.7.4.1 Upstream	
1.7.4.2 Downstream	
1.7.5 Calibration procedure and frequency:	
1.7.5.1 Upstream	

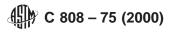


TABLE 2 Description of Test Device and Techniques Continued

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
1.8.2 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
1.9.2 Type of measuring element
1.9.3 Type of frecording 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 \square , other
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 now monitored and controlled, modeling imms)
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

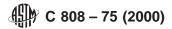


TABLE 3 Description of Carbon Test Specimen

1. DESCRIPTION OF CARBON MATERIAL				
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 timehours				
2. DESCRIPTION OF TEST SPECIMEN				
2.1 Location and Orientation in Original Billet				
2.2 Grain Size and Orientation in Test Specimen				
O O Missastonatona (susside altatale an altatale	Before Test		After Test	
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)				
2.6.2 Waviness (specify method used)				
2.6.3 Flatness (specify method used) 2.7 Hardness and Location Where Measured	· · · · · · · · · · · · · · · · · · ·	μm		μm
2.8 Density and Method Used				
2.0 Density and Method Osed .				
TABLE 4. December 1	vintion of Motion Mombou	Toot Specimen		
	ription of Mating Member	Test Specimen		
1. DESCRIPTION OF MATING MEMBER MATERIAL				
1.1 Manufacturer				
1.2 Commercial Name				
1.3 Chemical Composition Limits				
1.4.1 Processing	····			
1.4.2 Heat treatment	· · · · · · · · · · · · · · · · · · ·			
2. DESCRIPTION OF TEST SPECIMEN				
2.1 Location and Orientation in As-Received Piece				
2.2 Grain Size and Orientation in Test Specimen				
2.3 <i>Microstructure:</i> cystalline □, polycrystalline □, amorphous □, oth (provide sketch or photo)	er	· · · · · · · · · · · · · · · · · · ·		
•	Before Test		After Test	
2.4 Dimension and Tolerances (provide print)	Deloie Test		WILES LESS	
2.5 Test Surface Condition:				
2.5.1 Roughness (specify method used)		1170 22		um no
2.5.2 Waviness (specify method used)				µііі аа
2.5.3 Flatness (specify method used)				um
2.6 Hardness and Location Where Measured		µ···		μ···
	 			

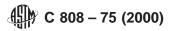


TABLE 5 Report of Friction and Wear Test Results

1. D/	ATE OF TEST	TEST NO	MA	CHINE NO	OPERATOR			
2. C	ARBON TEST SPE	CIMEN IDENTIFICATION	ON: GRADE NO.	LOT NO.	SPECIMEN	NO		
3. M	ATING MEMBER T	EST SPECIMEN IDEN	TIFICATION: SP	ECIMEN NO.				
5. TE	EST CONDITIONS	IN THIS SERIES: FRIC				od of calculation		
5.2 S	Speed	_m/s (_	ft/s),rev,	/min, other			
5.3.1 5.3.2 5.4 F 5.4.1 5.4.2 5.4.3 5.5 F	Downstream Fluid Pressure: Upstream Downstream Differential Flow Across Test Sp	K (K (Pa absolute (Pa absolute — Pa differential pecimens (if controlled)	°F) psia) (psia) (p	sid)				
		CIMEN TEMPERATUR						
6.2 E 6.3 N 6.4 F	quilibrium or Avera Maximum Temperati	ige Temperature ure K (K (°F);	°F); how ar how and when obta	nd when obtained ined			
		c Friction	_ N (lbf),	N-m (lbf·ft), other	; how obtained	
7.3 <i>E</i>	and when obtained Equilibrium or Avera	ge Friction	N (lbf), N·m (lbf·ft), other _	; he	lbf·ft), other ow and when obtained how and when obtained _	
7.5 F	Final Friction	N (lbf),	N·m (lbf·ft), other	; how	and when obtained	
-				1,00				
8.1.1	Carbon Test Specim Wear measuremen	nt lengti						
	where measured				than that used to meas	sure wear	m/m (in./in.); how and
8.1.4	Wear: per unit tim		ınit of distance tr	aveled				
8.1.6	Surface roughnes	rn surface (provide ske s (μm aa): before test .			after	r test		
	Hardness: before Mating Member Tes				after test			
8.2.1 8.2.2	Wear measureme If length used, line where measured	nt lengtl ear dimensional change	he of some refere	weight nce dimension other	_ volume; accuracy and than that used to meas	how obtained _ sure wear	m/m (_ in./in.); how and
8.2.3 8.2.4	Time duration of v	wearingner u	minutes,	hours				
825	Description of wo	rn surface (provide ske	etch or photo)					
	Surface roughnes Hardness: before				after test	r test		
9. FL	LOW ACROSS TE	ST SPECIMENS						
9.2 E 9.3 A	Equilibrium or Avera Maximum Flow	; how and w	; how and when then obtained	obtained				
10. \$	SUSPENDED TEST	г						
10.1 10.2	Reason for Test St Time Duration Befo	uspension ore Suspension	minutes,	hour	s		· · · · · · · · · · · · · · · · · · ·	

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