



**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		

**TABLE 5 Report of Friction and Wear Test Results**

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**1. DATE OF TEST** \_\_\_\_\_ **TEST NO.** \_\_\_\_\_ **MACHINE NO.** \_\_\_\_\_ **OPERATOR** \_\_\_\_\_

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**2. CARBON TEST SPECIMEN IDENTIFICATION: GRADE NO.** \_\_\_\_\_ **LOT NO.** \_\_\_\_\_ **SPECIMEN NO.** \_\_\_\_\_

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**3. MATING MEMBER TEST SPECIMEN IDENTIFICATION: SPECIMEN NO.** \_\_\_\_\_

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**4. NUMBER OF TESTS IN THIS SERIES: FRICTION** \_\_\_\_\_ **WEAR** \_\_\_\_\_

**5. TEST CONDITIONS**

5.1 *Unit Load* \_\_\_\_\_ Pa ( \_\_\_\_\_ psi). Specify whether net or applied load, and describe method of calculation \_\_\_\_\_

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5.2 *Speed* \_\_\_\_\_ m/s ( \_\_\_\_\_ ft/s , \_\_\_\_\_ rev/min, other \_\_\_\_\_)

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5.3 *Fluid Temperature:*

5.3.1 Upstream \_\_\_\_\_ K ( \_\_\_\_\_ °F)

5.3.2 Downstream \_\_\_\_\_ K ( \_\_\_\_\_ °F)

5.4 *Fluid Pressure:*

5.4.1 Upstream \_\_\_\_\_ Pa absolute ( \_\_\_\_\_ psia)

5.4.2 Downstream \_\_\_\_\_ Pa absolute ( \_\_\_\_\_ psia)

5.4.3 Differential \_\_\_\_\_ Pa differential ( \_\_\_\_\_ psid)

5.5 *Flow Across Test Specimens* (if controlled) \_\_\_\_\_

5.6 *Flow Through Test Cavity* \_\_\_\_\_

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**6. CARBON TEST SPECIMEN TEMPERATURE**

6.1 *Start-Up Temperature* \_\_\_\_\_ K ( \_\_\_\_\_ °F); how and when obtained \_\_\_\_\_

6.2 *Equilibrium or Average Temperature* \_\_\_\_\_ K ( \_\_\_\_\_ °F); how and when obtained \_\_\_\_\_

6.3 *Maximum Temperature* \_\_\_\_\_ K ( \_\_\_\_\_ °F); how and when obtained \_\_\_\_\_

6.4 *Final Temperature* \_\_\_\_\_ K ( \_\_\_\_\_ °F); how and when obtained \_\_\_\_\_

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**7. FRICTION**

7.1 *Break-Away or Static Friction* \_\_\_\_\_ N ( \_\_\_\_\_ lbf), \_\_\_\_\_ N·m ( \_\_\_\_\_ lbf·ft), other \_\_\_\_\_ ; how obtained \_\_\_\_\_

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7.2 *Start-Up Friction* (if different from break-away friction) \_\_\_\_\_ N ( \_\_\_\_\_ lbf), \_\_\_\_\_ N·m ( \_\_\_\_\_ lbf·ft), other \_\_\_\_\_ ; how and when obtained \_\_\_\_\_

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7.3 *Equilibrium or Average Friction* \_\_\_\_\_ N ( \_\_\_\_\_ lbf), \_\_\_\_\_ N·m ( \_\_\_\_\_ lbf·ft), other \_\_\_\_\_ ; how and when obtained \_\_\_\_\_

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7.4 *Maximum Friction* \_\_\_\_\_ N ( \_\_\_\_\_ lbf), \_\_\_\_\_ N·m ( \_\_\_\_\_ lbf·ft), other \_\_\_\_\_ ; how and when obtained \_\_\_\_\_

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7.5 *Final Friction* \_\_\_\_\_ N ( \_\_\_\_\_ lbf), \_\_\_\_\_ N·m ( \_\_\_\_\_ lbf·ft), other \_\_\_\_\_ ; how and when obtained \_\_\_\_\_

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**8. WEAR**

8.1 *Carbon Test Specimen:*

8.1.1 Wear measurement \_\_\_\_\_ length, \_\_\_\_\_ weight, \_\_\_\_\_ volume; accuracy and how obtained \_\_\_\_\_

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8.1.2 If length used, linear dimensional change of some reference dimension other than that used to measure wear \_\_\_\_\_ m/m ( \_\_\_\_\_ in./in.); how and where measured \_\_\_\_\_

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8.1.3 Time duration of wear \_\_\_\_\_ minutes, \_\_\_\_\_ hours

8.1.4 Wear: per unit time \_\_\_\_\_ , per unit of distance traveled \_\_\_\_\_

8.1.5 Description of worn surface (provide sketch or photo) \_\_\_\_\_

8.1.6 Surface roughness ( $\mu\text{m aa}$ ): before test \_\_\_\_\_ after test \_\_\_\_\_

8.1.7 Hardness: before test \_\_\_\_\_ after test \_\_\_\_\_

8.2 *Mating Member Test Specimen:*

8.2.1 Wear measurement \_\_\_\_\_ length \_\_\_\_\_ weight \_\_\_\_\_ volume; accuracy and how obtained \_\_\_\_\_

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8.2.2 If length used, linear dimensional change of some reference dimension other than that used to measure wear \_\_\_\_\_ m/m ( \_\_\_\_\_ in./in.): how and where measured \_\_\_\_\_

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8.2.3 Time duration of wearing \_\_\_\_\_ minutes, \_\_\_\_\_ hours

8.2.4 Wear: per unit time \_\_\_\_\_ per unit of distance traveled \_\_\_\_\_

8.2.5 Description of worn surface (provide sketch or photo) \_\_\_\_\_

8.2.6 Surface roughness ( $\mu\text{m aa}$ ): before test \_\_\_\_\_ after test \_\_\_\_\_

8.2.7 Hardness: before test \_\_\_\_\_ after test \_\_\_\_\_

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**9. FLOW ACROSS TEST SPECIMENS**

9.1 *Start-Up Flow* \_\_\_\_\_ ; how and when obtained \_\_\_\_\_

9.2 *Equilibrium or Average Flow* \_\_\_\_\_ ; how and when obtained \_\_\_\_\_

9.3 *Maximum Flow* \_\_\_\_\_ ; how and when obtained \_\_\_\_\_

9.4 *Final Flow* \_\_\_\_\_ ; how and when obtained \_\_\_\_\_

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**10. SUSPENDED TEST**

10.1 *Reason for Test Suspension* \_\_\_\_\_

10.2 *Time Duration Before Suspension* \_\_\_\_\_ minutes, \_\_\_\_\_ hours

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