



Standard Guide for Fretting Fatigue Testing¹

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1. Scope

1.1 This guide defines terminology and covers general requirements for conducting fretting fatigue tests and reporting the results. It describes the general types of fretting fatigue tests and provides some suggestions on developing and conducting fretting fatigue test programs.

1.2 Fretting fatigue tests are designed to determine the effects of mechanical and environmental parameters on the fretting fatigue behavior of metallic materials. This guide is not intended to establish preference of one apparatus or specimen design over others, but will establish guidelines for adherence in the design, calibration, and use of fretting fatigue apparatus and recommend the means to collect, record, and reporting of the data.

1.3 The number of cycles to form a fretting fatigue crack is dependent on both the material of the fatigue specimen and fretting pad, the geometry of contact between the two, and the method by which the loading and displacement are imposed. Similar to wear behavior of materials, it is important to consider fretting fatigue as a system response, instead of a material response. Because of this dependency on the configuration of the system, quantifiable comparisons of various material combinations should be based on tests using similar fretting fatigue configurations and material couples.

1.4 *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

E3 Guide for Preparation of Metallographic Specimens

¹ This guide is under the jurisdiction of ASTM Committee E08 on Fatigue and Fracture and is the direct responsibility of Subcommittee E08.05 on Cyclic Deformation and Fatigue Crack Formation.

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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.

E4 Practices for Force Verification of Testing Machines
E466 Practice for Conducting Force Controlled Constant Amplitude Axial Fatigue Tests of Metallic Materials
E467 Practice for Verification of Constant Amplitude Dynamic Forces in an Axial Fatigue Testing System
E468 Practice for Presentation of Constant Amplitude Fatigue Test Results for Metallic Materials
E1012 Practice for Verification of Testing Frame and Specimen Alignment Under Tensile and Compressive Axial Force Application
E1823 Terminology Relating to Fatigue and Fracture Testing
E1942 Guide for Evaluating Data Acquisition Systems Used in Cyclic Fatigue and Fracture Mechanics Testing
G15 Terminology Relating to Corrosion and Corrosion Testing (Withdrawn 2010)³
G40 Terminology Relating to Wear and Erosion
G190 Guide for Developing and Selecting Wear Tests

3. Terminology

3.1 Definitions and symbols used in this guide are in accordance with Terminology **E1823**. Relevant definitions from Terminology **G15** or **G40** are provided in 3.2. Additional definitions specific to this guide are provided in 3.3.

3.2 Definitions:

3.2.1 Terms from Terminologies **G15** and **G40**.

3.2.2 *coefficient of friction (COF)*—The dimensionless ratio of the tangential force, Q , between two bodies to the normal force, P , pressing these bodies together when the two bodies are slipping with respect to each other, $\mu=Q/P$.

3.2.2.1 *Discussion*—Under partial slip conditions, the ratio of the tangential force to the normal force is less than the COF. In addition, when COF is defined as the ratio of Q to P , the measured COF is an average along the interface. In reality, the COF can vary along the interface. Hence, a local definition is often used, given by $\mu(x,y)=q(x,y)/p(x,y)$ where $q(x,y)$ is the shear traction distribution along the interface and $p(x,y)$ is the normal pressure distribution. The COF is often greater in the slip regions of a partial slip interface compared to the stick regions due to the disruptions in the surface caused by fretting.

G40

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