



# Standard Practice for Fretting Corrosion Testing of Modular Implant Interfaces: Hip Femoral Head-Bore and Cone Taper Interface<sup>1</sup>

This standard is issued under the fixed designation F1875; 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 practice describes the testing, analytical, and characterization methods for evaluating the mechanical stability of the bore and cone interface of the head and stem junction of modular hip implants subjected to cyclic loading by measurements of fretting corrosion **(1-5)**.<sup>2</sup> Two test methods described are as follows:

1.1.1 *Method I*—The primary purpose of this method is to provide a uniform set of guidelines for long-term testing to determine the amount of damage by measurement of the production of corrosion products and particulate debris from fretting and fretting corrosion. Damage is also assessed by characterization of the damage to the bore and cone surfaces **(4, 5)**.

1.1.2 *Methods II*—This method provides for short-term electrochemical evaluation of the fretting corrosion of the modular interface. It is not the intent of this method to produce damage nor particulate debris but rather to provide a rapid method for qualitative assessment of design changes which do not include material changes **(1-4)**.

1.2 This practice does not provide for judgment or prediction of *in-vivo* implant performance, but rather provides for a uniform set of guidelines for evaluating relative differences in performance between differing implant designs, constructs, or materials with performance defined in the context of the amount of fretting and fretting corrosion. Also, this practice should permit direct comparison of fretting corrosion data between independent research groups, and thus provide for building of a data base on modular implant performance.

1.3 This practice provides for comparative testing of manufactured hip femoral heads and stems and for coupon type specimen testing where the male taper portion of the modular junction does not include the entire hip implant, with the taper

portion of the coupon identical in design, manufacturing, and materials to the taper of the final hip implant **(4,5)**.

1.4 Method I of this practice permits simultaneous evaluation of the fatigue strength of a femoral hip stem (in accordance with Practice **F1440**) and the mechanical stability and debris generated by fretting and fretting corrosion of the modular interface.

1.5 The general concepts and methodologies described in this practice could be applied to the study of other modular interfaces in total joint prostheses.

1.6 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.7 *This standard may involve hazardous materials, operations, and equipment. 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:<sup>3</sup>

- 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
- F561** Practice for Retrieval and Analysis of Medical Devices, and Associated Tissues and Fluids
- F746** Test Method for Pitting or Crevice Corrosion of Metallic Surgical Implant Materials
- F897** Test Method for Measuring Fretting Corrosion of Osteosynthesis Plates and Screws
- F1440** Practice for Cyclic Fatigue Testing of Metallic Stemmed Hip Arthroplasty Femoral Components Without

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee **F04** on Medical and Surgical Materials and Devices and is the direct responsibility of Subcommittee **F04.15** on Material Test Methods

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<sup>2</sup> The bold face numbers in parentheses refers to the list of references at the end of this standard.

<sup>3</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.