



Standard Test Method for Wear Testing of Polymeric Materials Used in Total Joint Prostheses¹

This standard is issued under the fixed designation F732; 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 test method describes a laboratory method for evaluating the wear properties of combinations of materials that are being considered for use as bearing surfaces of human total joint prostheses. The body of this test method contains general methods which apply to all types of prosthesis wear applications while individual annexes describe specific wear test methods and clinical validation criteria tailored to each distinct wear application (for example, linear reciprocating motion, ball-cup (“hip-type”) wear, delamination wear, etc.). It is the intent of this test method to rank materials, within each wear application, for polymer wear rates under simulated physiological conditions. It must be recognized, however, that contact geometries and wear motions are simplified using such methods. This test method, therefore, represents only an initial stage in the full wear characterization of a candidate material.

1.2 All candidate materials should be tested in an appropriate joint simulator apparatus using prototype prostheses before being used in clinical trials in patients. The tests described in this test method are used to quickly and reliably screen material combinations for wear performance in different orthopaedic wear applications prior to committing them to more expensive and time-consuming joint simulator testing. In addition, these simplified tests can be used to relate material, surface finish, or other parameters to wear behavior on a more practical basis than is possible in joint simulator tests.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

¹ This test method 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.

Current edition approved June 1, 2011. Published July 2011. Originally approved in 1982. Last previous edition approved in 2006 as F732 – 00 (2006). DOI: 10.1520/F0732-00R11.

2. Referenced Documents

2.1 ASTM Standards:²

D883 Terminology Relating to Plastics

F75 Specification for Cobalt-28 Chromium-6 Molybdenum Alloy Castings and Casting Alloy for Surgical Implants (UNS R30075)

F86 Practice for Surface Preparation and Marking of Metallic Surgical Implants

F648 Specification for Ultra-High-Molecular-Weight Polyethylene Powder and Fabricated Form for Surgical Implants

F799 Specification for Cobalt-28Chromium-6Molybdenum Alloy Forgings for Surgical Implants (UNS R31537, R31538, R31539)

F1537 Specification for Wrought Cobalt-28Chromium-6Molybdenum Alloys for Surgical Implants (UNS R31537, UNS R31538, and UNS R31539)

F2025 Practice for Gravimetric Measurement of Polymeric Components for Wear Assessment

G40 Terminology Relating to Wear and Erosion

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *wear*—for the purpose of this test method, the progressive loss of material from the polymer specimen as a result of the oscillating motion against the counterface under load. Wear may be generated by several mechanisms including adhesion, two or three body abrasion, surface fatigue, or other processes.

3.1.2 *wear rate*—the volume of material lost due to wear per unit of sliding distance (or per million wear cycles if complex motion patterns result in a non-uniform sliding distance across the specimen; see 4.3).

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.