



Standard Test Method for Coefficient of Friction, Yarn to Yarn¹

This standard is issued under the fixed designation D3412/D3412M; 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 covers the measurement of frictional properties for both continuous filament and spun-staple yarns under boundary friction conditions.

1.2 This test method has been used with yarns having linear densities ranging from 1.5 to 400 tex, but may be used with yarns outside these ranges [15 to 3600 denier].

NOTE 1—For coefficient of friction, yarn to metal, see Test Method [D3108/D3108M](#).

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.

1.4 *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

[D123 Terminology Relating to Textiles](#)

[D1776 Practice for Conditioning and Testing Textiles](#)

[D1907 Test Method for Linear Density of Yarn \(Yarn Number\) by the Skein Method](#)

[D2258 Practice for Sampling Yarn for Testing](#)

[D3108/D3108M Test Method for Coefficient of Friction, Yarn to Solid Material](#)

[D4849 Terminology Related to Yarns and Fibers](#)

3. Terminology

3.1 For all terminology relating to [D13.58](#), Yarns and Fibers, refer to Terminology [D4849](#).

¹ This test method is under the jurisdiction of ASTM Committee [D13](#) on Textiles and is the direct responsibility of Subcommittee [D13.58](#) on Yarns and Fibers.

Current edition approved July 1, 2013. Published August 2013. Originally approved in 1975T. Last previous edition approved in 2007 as D3412 – 07. DOI: 10.1520/D3412_D3412M-13.

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.

3.2 For all other terminology related to textiles, refer to Terminology [D123](#).

4. Summary of Test Method

4.1 A length of yarn is moved at a known speed in contact with itself or similar yarn at a specified wrap angle. The input and output tensions are measured and the coefficient of friction calculated. Alternatively, apparatus may be used in which the ratio of input to output tension is measured allowing the coefficient of friction to be indicated directly.

4.2 Three optional procedures are included. Option 1 is based on the Twisted Strand Method, using a wrap angle of 15.71 rad [900°]. Option 2 is based on the Capstan Method, using a wrap angle of 3.14 radians [180°]. Option 3 is based on the Fixed Yarn-Body Capstan Method, using a wrap angle of 3.14 radians [180°].

NOTE 2—Editions of Test Method D3412/D3412M prior to the 1986 revision incorrectly stated the wrap angle for Option 1 to be 18.85 rad. This is incorrect, since 3 turns of the swivel pulley do not result in a wrap angle of 18.85 radians. This has now been corrected to 15.71 rad. This should be taken into account in comparing with earlier results.

5. Significance and Use

5.1 This test method for testing yarn-to-yarn friction is being used, but is not recommended, for acceptance testing of commercial shipments since between-laboratory precision is known to be poor.

5.1.1 In some cases, the purchaser and supplier may have to test a commercial shipment of one or more specific materials by the best available method even though the method has not been recommended for acceptance testing of commercial shipments. In case of a dispute arising from differences in reported test results when using Test Method D3412/D3412M for acceptance testing of commercial shipments, the purchaser and the supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take a group of test specimens that are as homogeneous as possible and that are from a lot of material of the type in question. The test specimens should then be randomly assigned in equal numbers to each laboratory for testing. The average results from the two laboratories should be compared using Student's *t*-test for unpaired data and an acceptable probability level chosen by the