



Designation: D2061 – 07 (Reapproved 2021)

Standard Test Methods for Strength Tests for Zippers¹

This standard is issued under the fixed designation D2061; 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 These test methods cover the determination of the strengths for zipper and zipper parts. All methods are not suitable for use with all kinds of zipper. The restrictions, if any, are indicated in the scope for each individual test method. The test methods appear as follows:

	Sections
Holding Strengths of Separable Units	25 – 32
Holding Strength of Slider Lock	92 – 100
Holding Strength of Stops	17 – 24
Resistance to Angular Pull-Off of Slider Pull	82 – 91
Resistance to Cushioned Compression of Sliders	33 – 42
Resistance to Pull-Off of Slider Pull	72 – 81
Resistance to Twist of Pull and Slider	52 – 61
Slider Deflection and Recovery	43 – 51
Strength of Chains and Elements	9 – 16
Torsional Resistance of Slider Pull for Removal of Components	62 – 71

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

¹ These test methods are under the jurisdiction of ASTM Committee D13 on Textiles are the direct responsibility of Subcommittee D13.54 on Subassemblies and were developed in cooperation with the American Fastener and Closure Assn.

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² For referenced ASTM standards, visit the ASTM web site, 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 web site.

D76/D76M Specification for Tensile Testing Machines for Textiles

D123 Terminology Relating to Textiles

D1776/D1776M Practice for Conditioning and Testing Textiles

D2050 Terminology Relating to Subassemblies Used in the Manufacture of Textiles

D2051 Test Method for Durability of Finish of Zippers to Laundering

D2052 Test Method for Colorfastness of Zippers to Dry-cleaning

D2053 Test Method for Colorfastness of Zippers to Light

D2054 Test Method for Colorfastness of Zipper Tapes to Crocking

D2057 Test Method for Colorfastness of Zippers to Laundering

D2058 Test Method for Durability of Finish of Zippers to Drycleaning

D2059/D2059M Test Method for Resistance of Zippers to Salt Spray (Fog)

D2060 Test Methods for Measuring Zipper Dimensions

D2062 Test Methods for Operability of Zippers

2.2 U. S. Government Standard:

MIL-105D Sampling Procedures and Tables for Inspection by Attributes³

3. Terminology

3.1 Definitions:

3.1.1 For definitions of zipper terms used in this standard, refer to Terminology D2050. For definitions of other textile terminology used in this standard, refer to Terminology D123.

4. Significance and Use

4.1 The usefulness of a zipper in service can be evaluated by these tests. No one test determines the suitability of a zipper for a specific end use. Since the tests are inter-related more than one may be needed for a complete evaluation.

4.2 These methods are considered satisfactory for acceptance testing of commercial shipments because the methods have been used extensively in the trade for this purpose, and

³ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

because estimates of current between-laboratory precision are acceptable in most cases.

4.2.1 If there are differences of practical significance between reported test results for two laboratories (or more), comparative test should be performed to determine if there is a statistical bias between them, using competent statistical assistance. As a minimum, the test samples should be used that are as homogeneous as possible, that are drawn from the material from which the disparate test results were obtained, and that are randomly assigned in equal numbers to each laboratory for testing. Other materials with established test values may be used for this purpose. The test results from the two laboratories should be compared using a statistical test for unpaired data, at a probability level chosen prior to the testing series. If a bias is found, either its cause must be found and corrected, or future test results must be adjusted in consideration of the known bias.

4.3 The method(s) in the standard along with those in Test Methods **D2051**, **D2052**, **D2053**, **D2054**, **D2057**, **D2058**, **D2059/D2059M**, **D2060**, and **D2062** are a collection of proven test methods. They can be used as aids in the evaluation of zippers without the need for a thorough knowledge of zippers. The enumerated test methods do not provide for the evaluation of all zipper properties. Besides those properties measured by means of the enumerated test methods there are other properties that may be important for the satisfactory performance of a zipper. Test methods for measuring those properties have not been published either because no practical methods have yet been developed or because a valid evaluation of the information resulting from existing unpublished methods requires an intimate and thorough knowledge of zippers.

5. Sampling

5.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of individual containers from each shipping carton as directed in an applicable material specification or other agreement between the purchaser and the supplier. Consider individual containers from each shipping carton to be the primary sampling units.

NOTE 1—An adequate specification or other agreement between the purchaser and supplier requires taking into account the variability between shipping cartons and between zippers in a container to provide a sampling plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

5.2 *Laboratory Sample and Test Specimens*—As a laboratory sample for acceptance testing, take the number of zippers specified in Section 6 at random from each container in the lot sample. Consider the zippers as both the laboratory sample and the test specimens.

6. Number of Specimens

6.1 *Variables*—Take a number of zippers per individual container from each shipping carton such that the user may expect at the 90 % probability level that the test result for an individual container is no more than 10 % of the average, above or below the true average for the individual container. Determine the number of zippers per individual container as follows:

6.1.1 *Reliable Estimate of v* —When there is a reliable estimate of v based upon extensive past records for similar materials tested in the users laboratory as directed in the method, calculate n using **Eq 1**.

$$n = t^2 \times v^2 / A^2 = 0.0270 v^2 \quad (1)$$

where:

- n = number of specimens (rounded upward to a whole number),
- v = reliable estimate of the coefficient of variation of individual observations in the users laboratory under conditions of single-operation precision,
- t = 1.645, the value of Student's t for infinite degrees of freedom, two-sided limits and a 90 % probability level ($t^2 = 2.706$),
- A = 10.0 % of the average, the value of the allowable variation, and
- 0.0270 = a value calculated from t^2/A^2

6.1.2 *No Reliable Estimate of v* —When there is no reliable estimate of v for the users laboratory, **Eq 1** should not be used directly. Instead, specify the number of specimens shown in **Table 1**. This number of specimens is calculated using values of v which are somewhat larger values of v than are usually found in practice. When a reliable estimate of v for the users laboratory becomes available, **Eq 1** will usually specify fewer than the number of specimens shown in **Table 1**.

6.2 *Attributes*—For methods for which the test result merely states whether there is conformance to the criteria for success specified in the procedure, take the number of specimens directed in MIL Standard 105D for the level of inspection agreed upon by the purchaser and the seller. The methods to which these instructions apply are as follows:

	Sections
Resistance to Cushioned Compression of Sliders	30 – 38
Resistance to Pull-Off of Slider Pull	56 – 74
Resistance to Angular Pull-Off of Slider Pull	75 – 83
Holding Strength of Slider Lock	84 – 91

7. Test Specimen

7.1 The test specimen may consist of a completely assembled zipper, length of chain, or a component, as specified in the individual method. Unless otherwise specified the zipper shall not be attached to an application when testing.

8. Conditioning

8.1 Bring the specimens to moisture equilibrium for testing in the standard atmosphere for testing textiles as directed in Practice **D1776/D1776M** unless otherwise specified (see **38.1**, **48.1**, **57.1**, and **87.1**). Preconditioning is not required for zippers other than those made of nylon.

STRENGTHS OF CHAINS AND ELEMENTS

9. Scope

9.1 These test methods cover the determination of the strengths of zipper chains and elements in tensile tests.

9.2 The element pull-off and element slippage tests apply to separate element zippers only.