Designation: D 3652/D 3652M – 01

Standard Test Method for Thickness of Pressure-Sensitive Tapes[1]

This standard is issued under the fixed designation D 3652/D 3652M; 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.

This specification has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers the determination of the thickness of pressure-sensitive tapes at standard conditions.

1.2 The values stated in either SI 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 must be used independently, without combining values in any way.

1.3 This test method is intended to replace AFERA 4006[2] and PSTC 33[2].

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:*

D 996 Terminology of Packaging and Distribution Environments[3]

D 2904 Practice for Interlaboratory Testing of a Textile Test Method that Produces Normally Distributed Data[4]

D 2906 Practice for Statements on Precision and Bias for Textiles[4]

D 3715/D 3715M Practice for Quality Assurance of Pressure-Sensitive Tapes[3]

D 4332 Practice for Conditioning Containers, Packages, or Packing Components for Testing[3]

E 122 Practice for Choice of Sample Size to Estimate a Measure of Quality for a Lot or Process[5]

3. Terminology

3.1 *Definitions*—Terms found in Terminology D 996 shall apply.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *thickness (caliper, gage)*—the perpendicular distance between opposite surfaces of a tape expressed in mils [1/1000 in.]; usually measured under slight pressure with a special gage.

4. Significance and Use

4.1 Thickness is an important property of tapes, and this dimension is important for certain end uses. This test method is useful for quality control and for acceptance testing for conformance to specifications.

5. Apparatus

5.1 *Cailper Gage*, with the following requirements:

5.1.1 Two plain faces, the smaller of which is circular and 8 to 16 mm [0.32 to 0.64 in.] in diameter. The faces shall be parallel to within 0.005 mm [0.0002 in.] and constrained to move apart along an axis perpendicular to them.

5.1.2 When the specimen is placed between the faces, the force should be such that the specimen shall be under a 50 to 60 kPa [7.3 to 8.7 psi].

5.1.3 The distance between the graduations on the dial shall be such as to permit estimating the thickness to at least 0.002 mm [0.0001 in.].

6. Sampling

6.1 *Acceptance Sampling*—Sampling shall be in accordance with Practice D 3715/D 3715M.

6.2 *Sampling for Other Purposes*—The sampling and the number of test specimens depends on the purpose of testing. Practice E 122 is recommended. It is common to test at least five specimens of a particular tape. Test specimens should be taken from several rolls of a tape and, whenever possible, among several production runs of a tape. Strong conclusions about a specific property of a tape cannot be based on tests of a single unit (roll) of product.

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[1] This test method is under the jurisdiction of ASTM Committee D10 on Packaging and is the direct responsibility of Subcommittee D10.14 on Tape and Labels.

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[2] AFERA: Association des Fabricants de Rubans Auto-Adhesif; PSTC: Pressure Sensitive Tape Council (U.S.A.).

[3] *Annual Book of ASTM Standards*, Vol 15.09.

[4] *Annual Book of ASTM Standards*, Vol 07.01.

[5] *Annual Book of ASTM Standards*, Vol 14.02.

7. Test Specimens

7.1 The specimen width shall be greater than the diameter of the foot of the caliper gage and at least 50 mm [2 in.] long. It shall be free of wrinkles and creases.

7.2 Unwind and discard at least three but no more than six wraps of tape from the sample roll before taking specimens for testing.

7.3 Unless otherwise specified, remove one specimen per sample roll for each test performed. Remove the specimen from a freely rotating roll at the rate of approximately 500 to 750 mm [20 to 30 in.]/s. Where width or other factors make it impossible to remove the specimen at the prescribed rate, remove it at a rate as close to 500 mm [20 in.]/s as possible.

8. Conditioning

8.1 Condition sample rolls of tape in the standard conditioning atmosphere as described in Practice D 4332 for a period of not less than 24 h. Test at these conditions.

9. Procedure

9.1 Zero the instrument per manufacturer's instructions.

9.2 Place the specimen under the foot of the caliper gage, adhesive side up, and lower the the presser foot gently upon the surface of the tape. Record the reading of the dial to the nearest 0.002 mm [0.0001 in.] one second after lowering the foot. Make three readings for each specimen. Average the readings for the thickness value of the specimen.

9.3 To measure double-coated tapes with liner, measure the thickness of the specimen with one liner in place as in 9.2. Mark the liner where readings were made. Remove the liner and repeat the measurement as in 9.2 on the liner in the marked positions. Average both sets of readings; subtract the smaller average from the larger average, and record the difference as the thickness.

10. Report

10.1 The report shall include the following:

10.1.1 Statement that this test method was used and indicate any deviations from the test method as written.

10.1.2 Thickness in milllimetres to the nearest 0.002 mm [inches to the nearest 0.0001 in.].

10.1.3 Complete identification of each roll tested including tape source, manufacturer's code number and form.

11. Precision and Bias

11.1 *Summary*—The difference between two single observations should not exceed 6.8 % of the average of the two observations in 95 out of 100 cases when both observations are taken by the same well-trained operator using the same piece of test equipment and specimens randomly drawn from the same sample of material. Larger differences may occur under all other circumstances. The true value of thickness can only be defined in terms of a specific test method. Within this limitation, Test Method D 3652M has no known bias. The basis for this summary and for evaluations made under other conditions are given in 11.2 through 11.5.

11.2 *Interlaboratory Test Data*[6]—An interlaboratory study was made in 1980 in which randomly drawn samples of two materials were tested in each of six laboratories. Two operators in each laboratory each tested three specimens from each of three rolls of each material. The components of variance for thickness results expressed as coefficients of variation were calculated to be as follows:

	Specimens of the Same Material	Specimens of Different Material
Single-operator component	1.7 % of the average	8.8 % of the average
Within-laboratory component	3.5 % of the average	3.5 % of the average
Between-laboratory component	11.0 % of the average	6.7 % of the average
Replication component	1.8 % of the average	1.8 % of the average.

NOTE 1—The calculations for coefficient of variation and other statistics found in subsequent sections of this statement are described in Practice D 2906 and Annex A3 of Practice D 2904.

11.3 *Critical Differences*—For the components of variance reported in 11.2, two averages of observed values should be considered significantly different at the 95 % probability level if the difference equals or exceeds the critical differences shown in Table 1.

11.4 *Confidence Limits*—For the components of variance reported in 11.2, single averages of observed values have the 95 % confidence limits shown in Table 2.

NOTE 2—The tabulated values of the critical differences and confidence limits should be considered to be a general statement particularly with respect to between-laboratory precision. Before a meaningful statement can be made about two specific laboratories, the amount of statistical bias between them, if any, must be established with each comparison being based on recent data obtained on specimens randomly drawn from one sample of the material to be evaluated

11.5 *Bias*—No justifiable statement can be made on the bias of Test Method D 3652 for testing thickness since the true value cannot be established by an accepted referee method.

12. Keywords

12.1 caliper; gage; pressure-sensitive tape; thickness

[6] Supporting data are available from ASTM Headquarters. Request RR: D-10-1002.

TABLE 1 Critical Difference, % of Grand Average for the Conditions Noted[A,B]

Number of Observations in Each Average	Single-Operator Precision	Within-Laboratory Precision	Between-Laboratory Precision
Specimens of the Same Material:			
1	6.8	11.8	35.8
5	5.2	10.9	32.9
10	4.9	10.7	32.1
Specimens of Different Material:			
1	24.9	26.7	32.6
5	24.5	26.3	32.3
10	24.4	26.3	32.2

[A] The critical differences were calculated using $t = 1.960$ which is based on infinite degrees of freedom.

[B] To convert the values of the critical differences to units of measure, multiply the average of the two specific sets of data being compared by the critical differences expressed as a decimal fraction.

TABLE 2 Width of 95 % Confidence Limits, % of the Grand Average for the Conditions Noted[A,B]

Number of Observations in Each Average	Single-Operator Precision	Within-Laboratory Precision	Between-Laboratory Precision
Specimens of the Same Material:			
1	±4.8	±8.3	±25.3
5	±3.7	±7.7	±25.3
10	±3.5	±7.6	±22.7
Specimens of Different Material:			
1	±17.6	±18.9	±23.6
5	±17.4	±18.6	±22.8
10	±17.3	±18.6	±22.8

[A] The confidence limits are calculated using $t = 1.960$ which is based on infinite degrees of freedom.

[B] To convert the values of confidence limits to units of measure, multiply the average of the specific set of data that is of interest by the confidence limits expressed as a decimal fraction.