Designation: D 1212 – 91

Standard Test Methods for Measurement of Wet Film Thickness of Organic Coatings[1]

This standard is issued under the fixed designation D 1212; 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 wet film thickness of organic coatings such as paint, varnish, and lacquer. Two methods are described as follows:

1.1.1 In *Test Method A*, the Wet Film Thickness Gage (English or Metric graduation (see 5.1)) is used to measure wet film thicknesses up to 60 mils on the English scale series, and up to 700 µm on the metric scale series (Sections 5 through 8).

1.1.2 In *Test Method B*, the Pfund Gage is used to measure wet film thicknesses up to 14.2 mils (360 µm) (Sections 9 through 13).

1.2 *This standard does not purport to address if any, the safety problems associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Document

2.1 *ASTM Standard:*

D 823 Test Methods for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products on Test Panels[2]

3. Summary of Test Methods

3.1 The material is applied in the laboratory to plane, rigid test panels or in the field to the surface being coated. The wet film thickness is determined as quickly as possible to reduce shrinkage due to solvent loss.

3.2 In Test Method A, a gage with one eccentric and two concentric wheels is rolled over the surface and the point where the eccentric wheel first touches the wet film is determined.

3.3 In Test Method B, a gage with a convex lower surface is pushed into the wet film until the center touches the substrate. The diameter of the spot of wet coating left on the convex surface is measured and the film thickness calculated from the diameter of the spot and the radius of curvature.

4. Significance and Use

4.1 Wet film thickness measurements aid in the prediction of dry film thickness. In instances where dry film thickness cannot be measured nondestructively, wet film thickness is frequently specified. Also, the ability to determine wet film thickness during application can provide the opportunity to correct the application procedures.

TEST METHOD A

5. Apparatus

5.1 *Wet Film Thickness Gage*[3]—Two versions of the gage are now in use[4]: The original design as shown in Fig. 1 and a later design as shown in Fig. 2. Both designs consists of an eccentric center wheel supported by two concentric wheels so as to provide two scales that are bilaterally symmetrical. As the gage is rolled on the film, there is a change in clearance between the wet film and the eccentric wheel. The point at which the film first touches the center wheel measures the thickness of the film.

5.2 The later design shown in Fig. 2, moves the eccentric wheel from between the concentric wheels, as shown in Fig. 1, to the outside of the gage and closer to one of the concentric wheels. Gage reading errors of parallax across the gage are eliminated as the two scales are placed directly on the eccentric wheel and errors when measuring on uneven support surfaces are reduced by placing the eccentric wheel closer to one of the supporting concentric wheels.

5.3 Best precision is obtained when using the near linear central portion of each scale, constituting about 80 % of its total range as shown in the diagram in Figs. 1 and 2. Therefore, the range of the particular gage selected for use should be such that the measured film thickness falls within, and preferably toward the center of the middle 80 % of each scale. Gages are available covering the following ranges in mils and microns:

Range, mils	Smallest Graduation, mils
0 to 2	0.1
0 to 4	0.2
2 to 12	0.5
10 to 30	1.0
20 to 60	2.0

Range, µm	Smallest Graduation, µm
0 to 40	2.0
0 to 100	5.00
50 to 250	10.00
200 to 700	25.00

[1] These test methods are under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings and Materials and are the direct responsibility of Subcommittee D01.23 on Physical Properties of Applied Paint Films.

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[2] *Annual Book of ASTM Standards*, Vol 06.01.

[3] Available from BYK-Gardner, Inc., Gardner Laboratory, 2435 Linden Ln., Silver Spring, MD 20910 and from the Paul N. Gardner Company, Inc., 316 N.E. First Street, Pompano, FL 33060.

[4] Both versions of this gage (Interchemical (INMOT) and Model "C"), available from BYK-Gardner, Inc., are covered by U.S. Patents 2 507 592 and 3 128 558, and are held by Maynard R. Euverard, 113 Angall Town Ln., Williamsburg, VA 23185. Interested parties are invited to submit information regarding the identification of acceptable alternatives to this patented item to the Committee on Standards, ASTM Headquarters, 1916 Race St., Philadelphia, 19103. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

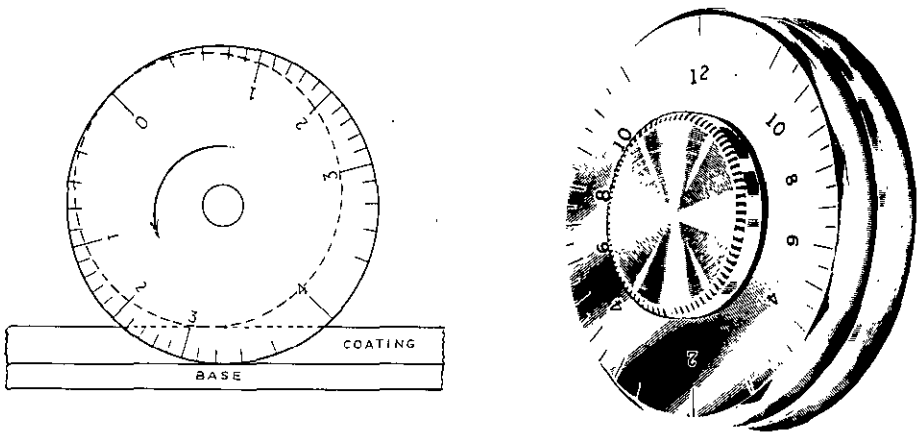

FIG. 1 Interchemical Wet Film Thickness Gages

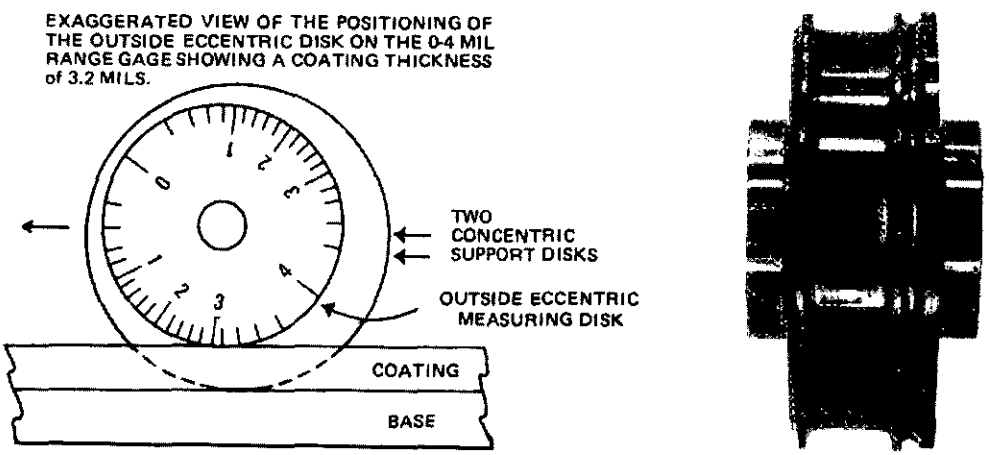

FIG. 2 Model "C" Wet Film Thickness Gages

6. Procedure

6.1 Apply the material in accordance with Test Methods D 823 to suitable plane rigid panels of area sufficiently large to permit film thickness measurements at least 1 in. (25 mm) from any edge. Determine the film thickness immediately after application.

6.2 Support the test panels on a suitable level base in such a way that there will be no movement or spring of the panels during the film thickness measurements. Place the gage on the wet film so that the minimum marking is at the top and the greatest clearance between the eccentric wheel and the film is directly over the wet film. Roll the gage over the film one-half revolution in one direction toward the minimum marking on the gage and repeat in the opposite direction. Read the points at which the coating first makes contact with the eccentric wheel and determine the mean which is considered as one reading.

6.3 If the coating contains a solvent that evaporates rapidly or if the solids content is low, make at least a second separate reading on a freshly applied film and calculate the mean of the separate readings.

7. Report

7.1 Report the mean of the separate readings and the range and smallest graduation of the gage used.

8. Precision[5]

8.1 In an interlaboratory study of this test method, in which two operators in at least six laboratories made measurements with the 0- to 2- and 0- to 4-mil gages on three materials, applied at two film thicknesses, the pooled within-laboratory standard deviation was found to be 0.12 mils with 34 df and the between-laboratories standard deviation 0.18 for two determinations and 0.17 for four determinations with 25 df. Based on these standard deviations, the following criteria should be used for judging the acceptability of results at the 95 % confidence level:

8.1.1 *Repeatability*—Results, each the mean of opposite rolls of the 0- to 2- or 0- to 4-mil gage, obtained by the same operator should be considered suspect if they differ by more than 0.4 mil for two determinations and 0.5 mil for four determinations.

8.1.2 *Reproducibility*—Two results, each the mean of two separate determinations, obtained by operators in different laboratories, should be considered suspect if they differ by more than 0.55 mil.

[5] Supporting data are available from ASTM Headquarters. Request RR: D01-1023.