



Standard Test Method for Hot Tack of Wax-Polymer Blends by the Flat Spring Test¹

This standard is issued under the fixed designation D 3706; 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 measures the hot tack of wax-polymer blends used to seal flexible packaging. The blend may be a uniform coating, or a post-applied adhesive.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *This standard does not purport to address all of the safety problems, 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. Terminology

2.1 Definitions:

2.1.1 *hot tack*—the cohesive strength during the cooling stage before solidification of a heat seal bond formed by a wax-polymer blend.

3. Summary of Test Method

3.1 Flexible packaging specimens are heat-sealed together over a series of temperatures and dwell times. Immediately after each seal is formed and before it has started to cool, a force tending to separate the specimens is applied by a calibrated spring. If the hot tack of the blend is strong enough, the seal remains closed until it has solidified; if not, the seal separates. Thus each spring force and test condition either passes or fails. The pattern of pass and fail results is plotted to show the blend characteristics.

4. Significance and Use

4.1 Many flexible packaging materials are formed into finished packages by joining surfaces with heat sealed bonds. The bond is formed by heating the surfaces and pressing together the areas to be joined. Because package forming and filling equipment must operate at high speeds, the pressure holding the surfaces together is usually released before the

bond has solidified. The bonding material must have enough hot tack while still molten to hold the sealed areas together until cool. The pattern of pass and fail results with this test method is characteristic of the wax-polymer blend, and can be correlated with end use requirements.

5. Apparatus

5.1 *Heat Sealer*,² with jaw temperature, jaw pressure, and jaw dwell time adjustable and automatically controlled.

5.2 *Calibrated Flat Springs*, made from 0.2-mm (7-mil) spring steel in the shape and with dimensions as shown in Fig. 1. Approximate spring pull at an indicated width is given for information.

5.3 *Direct Reading Balance*, with scale divisions not to exceed 3 g (0.1 oz). Universal testing equipment with the same sensitivity may also be used.

6. Test Specimens

6.1 Cut 75 by 300-mm (3 by 12-in.) strips from sheets of flexible packaging. The wax-polymer blend to be tested must cover the last 50 mm (2 in.) at each end of the test side of the strip.

6.2 Because variations in coating thickness can affect results, the coating must be uniform.

7. Calibration of Flat Springs

7.1 Place the spring on the platform of the balance and bend one end over to form a loop. Hold the ends of the spring one above the other and 3 mm ($\frac{1}{8}$ in.) apart by pressing on the upper end with the fingers or a pencil. Record the total force shown by the balance. Allow the spring to flex open and again press down until the ends are 3 mm ($\frac{1}{8}$ in.) apart. Repeat for a total of five readings.

NOTE 1—A piece of rubber or plastic sheeting may be placed on the balance under the spring to prevent sliding.

7.2 Calculate the net force by subtracting the tare (weight of spring plus sheeting) from the average of five readings.

7.3 Convert the net force into flat spring strength as follows:

$$A \text{ (oz/in.)} = F \times 0.333 \quad (1)$$

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.10.0A on Physical and Chemical Properties.

Current edition approved Oct. 31, 1988. Published December 1988. Originally published as D 3706-78. Last previous edition D 3706-78(1983).

² A heat sealer available from Packaging Industries, Ltd., Airport Rd., Hyannis, MA 02601, has been found satisfactory.