Designation: D3076 – 00 (Reapproved 2010)

Standard Test Methods for Effective Crimping on Outside Crimped Valves of Aerosol Containers[1]

This standard is issued under the fixed designation D3076; 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 effective crimping on outside crimped valves within the wide parameters of containers and valves available.

1.2 The test methods appear in the following order:

	Sections
Optical Comparator Test Method	4 to 7
Caliper Test Method	8 to 12

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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]

D996 Terminology of Packaging and Distribution Environments

D3064 Terminology Relating To Aerosol Products

3. Terminology

3.1 General definitions for packaging and distribution environments are found in Terminology D996.

3.2 General definitions of terms relating to aerosol products are found in D3064.

OPTICAL COMPARATOR TEST METHOD

4. Summary of Test Method

4.1 This test method involves drawing a projected, enlarged profile of the container and valve, then removing the valve and drawing the projected profile of the container finish. Measuring the resultant void and subtracting the dimensions of the essentially noncompressed components from this value results in the value representing the compressed thickness of the valve sealing gasket.

5. Significance and Use

5.1 This test method provides information for the establishment of quality control procedures on filling lines.

6. Apparatus

6.1 *Optical Comparator.*

6.2 *Clamping Jig,* fastened to the comparator bench.

6.3 *Grinder,* electric, small enough to be hand held.

7. Procedure

7.1 Crimp a valve on an empty bottle with the line crimper set at normal operation, and clamp the bottle in the jig on the comparator bench.

7.2 Draw the projected, enlarged image on tracing paper.

NOTE 1—Grid ruled tracing paper makes the tracing much easier.

7.3 Without disturbing the paper or bottle, cut a wedge out of the valve with the electric grinder, and remove the valve.

7.4 Trace the projected image of the container alone on the same paper.

7.5 Measure the void between the two silhouettes (Fig. 1 and Fig. 2). Subtract the dimensions (multiplied by the enlargement factor of the essentially uncompressed components of the valve) from this value to obtain the thickness of the compressed gasket multipled by the enlargement factor, and convert this reading into percent compression.

CALIPER TEST METHOD

8. Summary of Test Method

8.1 This test method involves a measurement of the height of the uncrimped portion of the valve. The points between

[1] These test methods are under the jurisdiction of ASTM Committee D10 on Packaging and are the direct responsibility of Subcommittee D10.33 on Mechanical Dispensers. These test methods were originally developed by the Chemical Specialties Manufacturers Assn.

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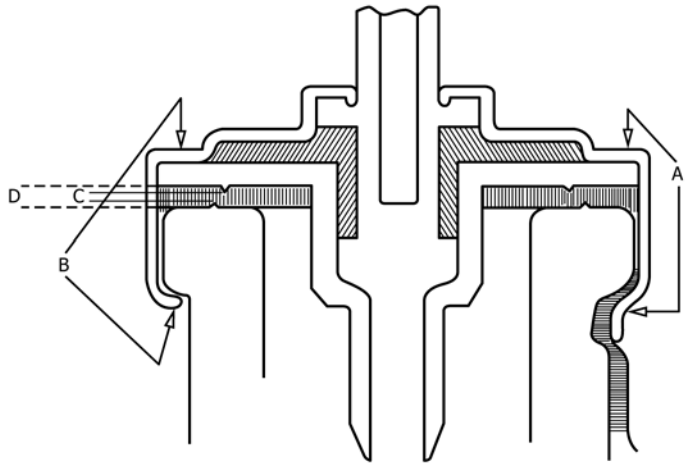
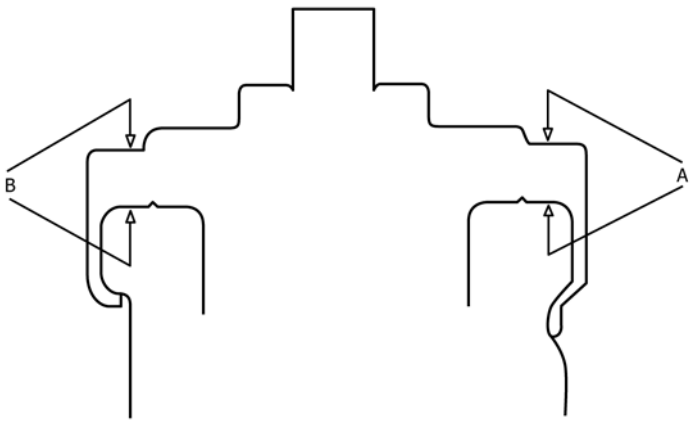
[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.



A—points between which effective crimp height measurement should be made (these points are self-determining when the calipers are held parallel to the side of the valve).
B—points between which a relative measurement may be established for nondestructure quality control use from optical comparator data.
C—effective compression.
D—flat compression.

FIG. 1 Effective Crimp Height



A—representation of a plastic-coated bottle.
B—representation of an uncoated bottle.

NOTE 1—*A* and *B* represent points between which measurements should be made after drawing the projected profiles.

FIG. 2 Optical Comparator Profile

which the measurement is made are self-determining when the calipers are held parallel to the side of the valve. Mean dimensions are used in calculating the effective crimp height.

9. Significance and Use

9.1 This test method provides information for the establishment of quality control procedures on filling lines.

10. Apparatus

10.1 *Calipers,* vernier or dial.

11. Procedure

11.1 Select a filled bottle from the filling line at random.

11.2 Mark off three points, 120° apart, on the valve ferrule, carefully avoiding areas where stake marks occur.

11.3 Holding the calipers parallel to the side of the valve, place the inner jaw on the top of the valve.

11.4 Slide the outer jaw up the valve skirt until it stops, due to the abrupt directional change in the skirt.

11.4.1 In collect-crimped bottles a line appears at the top of the crimped skirt area. This is made by the top of the collect segment, and is the point at which direction changes abruptly and the caliper will hang up.

11.4.2 Roll-capped bottles will also produce this horizontal line at the top of the crimped area. Depending upon the facial contour of the rollers, this line may be above or at the point of abrupt direction change. Letting the caliper find the point of direction change naturally, will eliminate doubt about this measurement.

11.5 Repeat this process at the other locations marked on the ferrule.

11.6 Record a reasonable agreement between any two readings as the effective crimp height (Fig. 1).

11.7 Measure the diameter of the uncrimped portion of the valve. Subtract the diameter of the crimped valve skirt from the diameter of the uncrimped portion of the valve. Record this value as the crimp diameter.

12. Calculation

12.1 Calculate the maximum crimp height for effective crimping, *M* (which needs to be determined only once for any bottle and valve combination), as follows:

$$M = A + (B/2) + C + 2D$$

where:

A = dimension of the bottle lip (excluding the sealing bead),
B = thickness of the sealing gasket,
C = thickness of the valve body flang (excluding the sealing bead), and
D = thickness of the valve ferrule.

12.2 When plastic-coated bottles are used, add 0.015 to the end of the equation in 12.1 to compensate for the nominal amount of plastic expected to be present under the lip of the bottle finish.

13. Precision and Bias

13.1 *Precision*—The precision of Test Methods D3076 is highly dependent on the type of can and aerosol valve being tested. While inside-crimped aerosol valves can operate within a standard dimensional target, such a single target cannot be readily obtained for outside-crimped aerosol valves. This is due to the wide tolerances of the containers and the tolerances of the valve components (especially the rubber gasket) utilized in the industry. One laboratory has investigated one aerosol valve/aluminum can combination with two replicate tests, yielding the following results:

Can #	Crimp Measurement (mm)
1	5,16
2	5,2
3	5,26
4	5,4
5	5,3
6	5,35
7	5,25
8	5,27
9	5,22
10	5,3
11	5,34
12	5,35
13	5,31
14	5,36
15	5,35
16	5,31
17	5,34
18	5,26
19	5,3
20	5,25
Mean Value	5,29
Standard Deviation	0,06
Max Value	5,35
Min Value	5,16

13.1.1 Other aerosol packages may have values different than the values disclosed in 13.1. Users of this test method are suggested to reference historical files of previous tests of similar aerosol packaging for an estimate of within-laboratory repeatability. The Committee believes that because of this strong product and component material dependency, further investigation of repeatability and reproducibility is not practicable.

13.2 Test Methods D3076 has no bias because an accepted reference or referee value is not available.

14. Keywords

14.1 aerosol packaging; crimp measurement of aerosol valves; outside-crimped aerosol valves

APPENDIX

(Nonmandatory Information)

X1. DISCUSSION

X1.1 Analyzing the similarities and differences between effective sealing of inside crimped valves and outside crimped valves, it becomes readily apparent that the main factor to consider for effective sealing in both cases is compression of the sealing member of the valve.

X1.2 Where a standard dimension is offered to the trade for inside crimped valves, such a single dimension or dimension range cannot readily be obtained for outside crimped valves, due to wide tolerances on the essential dimensions of glass containers and the wide variation between valves offered to the trade for glass aerosol containers.

X1.2.1 In spite of this situation, the possibility of establishing crimping dimensions is not eliminated, but it becomes a little more involved insofar as separate dimensions must be established for each valve-container combination.

X1.3 Mean dimensions were chosen for the caliper method formula to give approximately 20 % compression of the rubber gasket on the maximum bottle. Using the same crimper adjustment, a minimum bottle can produce a negligible flat compression, but will still have approximately 30 % effective compression even though the glass sealing bead is nonexistent.

X1.3.1 In calculating compression of the rubber gasket, it is recommended that the sealing beads on both the glass and valve body flange be ignored to provide a small safety factor.

X1.4 Serum vial type crimping, where the valve does not display a crimped skirt, cannot easily be measured by means of the calipers alone. An effective crimp height setting should be established by the optical comparator and a relative height measurement (by calipers) can be determined from the setting that produces an acceptable compression as determined by the comparator. This relative height can then be used nondestructively by quality control personnel on the filling lines to determine effective crimping.

X1.5 Minimum values for crimp diameter (that is, 0.060 for 20-mm valves and 0.030 for 15-mm valves) are those that an effective crimped valve requires pressures of over 400 psi (2.7 MPa) to exert sufficient force to unseat a 20-mm valve and over 500 psi (3.4 MPa) to unseat a 15-mm valve. In any case, it is desirable to press the skirt firmly against the side of the bottle for appearances and to prevent valve popping upon bottle breakage.