



Standard Test Methods for Measurement of Vertical Downward Forces to Disengage Type IIA Lug-Style Child-Resistant Closures¹

This standard is issued under the fixed designation D 3469; 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 methods² measure the downward forces during the disengagement of lug-style caps from their respective containers.

1.2 These test methods measure the maximum torque developed while the cap is further disengaged by turning of the container.

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

2. Referenced Documents

2.1 ASTM Standards:

D 3475 Classification of Child-Resistant Packages³

D 3481 Test Method for Shelling Two-Piece Child-Resistant Closures that are Activated by Two Simultaneous Dissimilar Motions³

E 105 Practice for Probability Sampling of Materials⁴

E 122 Practice for Choice of Sample Size to Estimate a Measure of Quality for a Lot or Process⁴

3. Terminology

3.1 Definitions:

3.1.1 *type IIA child-resistant closure*—a lug finish closure requiring a random push down while turning. (See Classification D 3475.)

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *vertical force to disengagement*—the amount of downward force required to release the lugs from a locked position (disengagement) so rotational movement can be achieved.

4. Summary of Test Method

4.1 The average downward force to disengage lugs of the cap from the several receptacles on the containers is obtained. The standard deviation may be determined for a given lot of packages. These measurements of force are recorded including torque generated in removal of the cap.

4.2 Test Methods A and B use a force-measuring device to determine the downward force required to disengage the lugs on the cap from the corresponding receptacles on the container with the downward travel being controlled through a specific distance. Test Methods A and B use different measuring devices. The correlation of results between the two test methods has not been evaluated.

4.3 *Test Method B*—This procedure uses the apparatus as shown in Fig. 1. The downward force is measured by a gage that is lowered onto the cap of the specimen. The vertical movement is controlled and the twisting of the cap is minimized while the vertical force is applied. The torque may be measured during this removal procedure when the test specimen is clamped in a suitable torque meter.

5. Significance and Use

5.1 These test methods may be used in establishing and confirming quality control standards.

5.2 These test methods may be used to establish performance standards for Type IIA child-resistant packages.

6. Apparatus

6.1 *Force-Measuring Scale (Test Method A)*,⁵ with a supporting stand maintaining the appropriate force gage in a vertical position similar to the design in Fig. 1 and incorporating an indicator for travel. A controlled vertical movement is desirable.

6.2 *Force-Measurement Machine (Test Method B)*,⁶ electronic compression tester.

¹ These test methods are under the jurisdiction of ASTM Committee D10 on Packaging and are the direct responsibility of Subcommittee D10.31 on Child-Resistant Packaging.

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² These test methods may provide a supplemental procedure to Test Method D 3471 that similarly require a random push-down while turning to open. Data generated may not be comparable to Test Method D 3471 procedure.

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

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ One force-measuring scale that has been found satisfactory is the Accuforce Cadet (0-20# scale), Ametek/Mansfield & Green Vision, Largo, FL 34643. Other force scales may or may not be satisfactory.

⁶ One compression tester that has been found satisfactory is the Thwing-Albert Instrument Co., 10960 Dutton Road, Philadelphia, PA 19154, Catalog No. 1274 Electronic Compression Tester. Other compression testers may or may not be satisfactory.

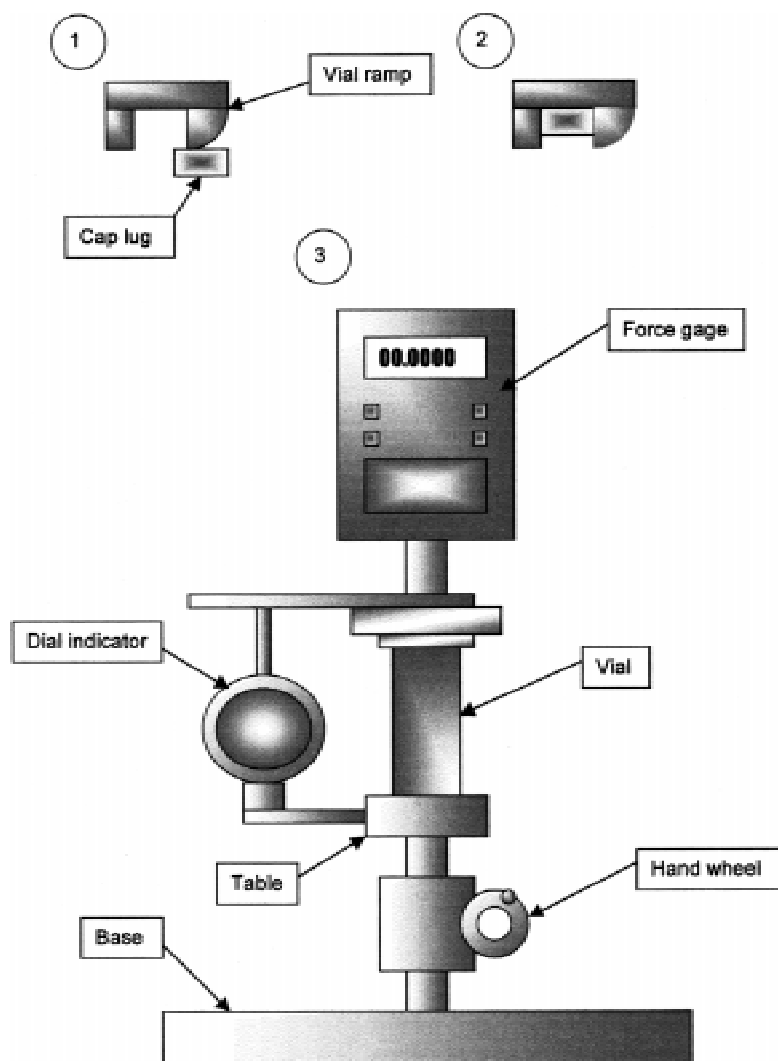


FIG. 1 Test Method A—Suggested Apparatus for Measuring Vertical Force to Disengage Closures with Simultaneous Torque Measurement

7. Sampling

7.1 The sample size will depend upon the particular objective of the test. For a given set of samples, sufficient measurements should be taken in accordance with established statistical sampling procedures.⁷

8. Calibration

8.1 Calibrate the vertical force measuring devices based on recommendations of the manufacturer.

9. Conditioning

9.1 Store the unassembled sample specimens for 24 h at $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ relative humidity, where applicable.

9.2 After assembly of the cap and container components, store at $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ relative humidity for an additional 24 h.

9.3 The atmosphere conditions in Table 1 shall otherwise apply when required for specific purposes. Other atmosphere conditions may also be used as appropriate.

10. Procedure

10.1 Test Method A:

10.1.1 Turn the gage on. Turn the dial indicator on.

10.1.2 Raise the dial indicator point to just touching the indicator bar; then move the indicator approximately 0.100 in.

TABLE 1 Atmospheric Conditions for Package Testing⁴

Temperature, °C	Relative Humidity, %
-55	...
-18	...
5	85
20	65
23	50
20	90
38	85
60	30

⁷ Refer to Practices E 105 and E 122 for more specific information.

⁴ Taken from ISO 2233.



after touching the bar. Ensure that the indicator point touches the indicator bar at all times.

10.1.3 Place the cap with fitment on to the vial and lock in the first position. (This position is just prior to slipping off the vial ramp into the fully locked position.)

10.1.4 Center part on the spacer plate of the table.

10.1.5 Turn the handwheel clockwise to raise the table until the gage reads approximately 0.30 lb.

10.1.6 Set the indicator at zero.

10.1.7 Turn the handwheel counterclockwise to lower the table until there is a large enough gap between the cap and gage to turn the cap until the cap is in the fully locked position.

10.1.8 Turn the handwheel clockwise to raise the table until the dial indicator again reads zero.

NOTE 1—This should be done with a steady uninterrupted movement.

10.1.9 Record the force from the force gage.

10.1.10 Turn the handwheel counterclockwise to lower table and remove the cap and the vial.

10.1.11 Repeat 10.1.3-10.1.10 for each sample to be measured.

10.1.12 When measurements are complete, lower the indicator so that the point does not touch the indicator bar.

10.2 *Test Method B:*

10.2.1 Turn the electronic tester on.

10.2.2 The load/speed setting should be set at NORMAL.

10.2.3 Check to see that the cross bar is in the UP position.

10.2.4 Turn the recorder ON.

10.2.5 Center the package under the load cell.

10.2.6 Adjust the travel to fit the package being tested.

10.2.7 Push the green TEST button to start the test.

10.2.8 When the recorder peaks and starts traveling to the left, push the STOP button.

10.2.9 After the STOP button has been pushed, push the UP button to return the cross bar to the starting position.

10.2.10 Remove the package and replace with the next package to be tested.

10.2.11 Repeat this test method until all packages have been tested.

11. Report

11.1 Report the following information:

11.1.1 General package description and identification of specific lot evaluated, relating if necessary mold cavity numbers, and component lot numbers,

11.1.2 Lot size and sampling technique,

11.1.3 Specific conditioning and time/duration of cycles if used,

11.1.4 Test method used, Test Method A or B,

11.1.5 Maximum, minimum, and average vertical forces for all specimens (in pounds-force or newtons),

11.1.6 Average of all forces reported on all specimens,

11.1.7 Standard deviations where required, and

11.1.8 Statement of having been tested in accordance with Test Methods D 3469.

12. Precision and Bias

12.1 *Precision*—The repeatability standard deviation for Test Method A is about 0.43 lb or 4.6 % of the average. The repeatability standard deviation for Test Method B is about 0.51 lb or 6.8 % of the average. These are based on limited data of one package from a single laboratory. Other packages may have different repeatability values. The reproducibility of these test methods is being determined.

12.2 *Bias*—No justifiable statement can be made on the bias of this test method since a true value cannot be established by an accepted referee method.

13. Keywords

13.1 child-resistant closure; downward force

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