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Standard Test Method for Determining Product Leakage from a Package with a Mechanical Pump Dispenser[1]

This standard is issued under the fixed designation D6834; 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 covers the evaluation of the ability of a pump dispenser to seal when the packaging is held under vacuum. Furthermore, it evaluates the seal between the pump dispenser and the neck container/closure integrity.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

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.*
See 4.3 for a specific warning statement.

2. Referenced Documents

2.1 *ASTM Standards:*[2]
D999 Test Methods for Vibration Testing of Shipping Containers
D3198 Test Method for Application and Removal Torque of Threaded or Lug-Style Closures

3. Significance and Use

3.1 This test method is suitable for establishing specifications of product leakage for both the pump dispenser and the final package. The test is performed at two levels of vacuum, a low and a high level, in order to avoid going directly from atmospheric pressure to 200 mbar, which can sometimes cause pump components that had not been fully seated, to seat.

3.1.1 *Method A*, Product Leakage Test without Vibration Testing of a Mechanical Pump Dispenser Package, is used when a pre-conditioning of the package in a simulated shipping situation is not desired.

3.1.2 *Method B*, Product Leakage Test with Vibration Testing of a Mechanical Pump Dispenser Package, is used when a pre-conditioning of the package in a simulated shipping situation is desired. The dynamics and stresses of shipping can create conditions where the package may be more likely to leak.

4. Apparatus

4.1 *Vacuum Chamber,* with a minimum capacity of 200 mbar (147 mm Hg).

4.2 *Absorbent Paper.*

NOTE 1—Alcohol–sensitive paper may be useful in verifying the points of leakage for alcohol based products since it is permanently stained with alcohol upon contact.

4.3 **Warning**—Appropriate handling consideration should be given to flammable, toxic, caustic, or other potentially hazardous materials used in this determination.

5. Sampling

5.1 Select an appropriate number of dry, unused pump dispensers at random for the precision and accuracy desired. A number of ten or more samples is recommended, but a minimum of three is acceptable.

6. Conditioning

6.1 If possible, condition the test specimen at 23 ± 3°C (73 ± 5.4°F) for not less than 4 h. If the test specimens are not conditioned at the recommended temperature, this should be noted in the test report discussed in 9.1.

7. Test Specimen and Sample

7.1 For each test specimen select a container to which the pump dispenser will be attached during the test. The actual bottle for final package is recommended for testing.

8. Procedures

METHOD A—PRODUCT LEAKAGE TEST WITHOUT VIBRATION TESTING OF A MECHANICAL PUMP DISPENSER PACKAGE

8.1 Fill each container with the liquid to be tested at the actual level of the final package target weight.

[1] This test method is under the jurisdiction of ASTM Committee D10 on Packaging and is the direct responsibility of Subcommittee D10.33 on Mechanical Dispensers .

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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.

8.2 Attach the pump dispenser securely to the container. For mechanical pump dispenser packages using a threaded or lug-style closure, follow Test Method D3198 for the proper method of closure application. Take care not to actuate the pump dispenser during this step.

8.3 Line the vacuum chamber shelves with the absorbent paper. The paper should be absent of stains so that it is easier to identify any leakage during the test.

8.4 Lay one or more containers on their side in the vacuum chamber.

NOTE 2—Packages should be oriented such that possible leakage points are visible when the vacuum chamber door is closed.

8.5 With the door of the vacuum chamber closed, start the pump and bring the vacuum level to a maximum of −850 mbar (absolute pressure, equal to −163 mbar).

8.5.1 Hold this level of vacuum for a minimum of 3 min and observe for signs of leakage. If leakage is observed, stop the test, and identify the leakage points and report findings in Section 9.

8.5.2 If no leakage has occurred, increase the level of vacuum to −200 mbar (absolute pressure, equal to −813 mbar).

8.5.3 Hold this level of vacuum for a minimum of 3 min and observe for signs of leakage. If leakage is observed, stop the test, and identify the leakage points and report findings in Section 9.

8.6 If leakage occurs, carefully disassemble the pump units from the container and identify possible causes for the leakage (for example: damaged seal surface, poorly molded neck-finish on the container, and so forth.). Report findings in Section 9.

METHOD B—PRODUCT LEAKAGE TEST WITH VIBRATION TESTING OF A MECHANICAL PUMP DISPENSER PACKAGE

8.7 Fill each container with the liquid to be tested at the actual level of the final package target weight.

8.8 Attach the pump dispenser securely to the container. For mechanical pump dispenser packages using a threaded or lug-style closure, follow Test Methods D3198 for the proper method of closure application. Take care not to actuate the pump dispenser during this step.

8.9 Place the filled containers in an appropriate carton so that they will remain firmly in place during vibration.

8.10 Proceed as directed according to Method D999 for 20 min each on bottom, top, and one side.

8.11 Remove the specimens from the carton. Examine all specimens for visible leakage without removing or disturbing the closure. Report the location of any leakage in Section 9.

8.12 Line the vacuum chamber shelves with the absorbent paper. The paper should be absent of stains so that it is easier to identify any leakage.

8.13 Lay one or more containers on their side in the vacuum chamber.

NOTE 3—Packages should be oriented such that possible leakage points are visible when the vacuum chamber door is closed.

8.14 Packages should be oriented such that possible leakage points are visible when the vacuum chamber door is closed.

8.15 With the door of the vacuum chamber closed, start the pump and bring the vacuum level to a maximum of −850 mbar (absolute pressure).

8.15.1 Hold this level of vacuum for a minimum of 3 min and observe for signs of leakage. If leakage is observed, stop the test, and identify the leakage points and report findings in Section 9.

8.15.2 If no leakage has occurred, increase the level of vacuum to −200 mbar (absolute pressure).

8.15.3 Hold this level of vacuum for a minimum of 3 min and observe for signs of leakage. If leakage is observed, stop the test, and identify the leakage points and report findings in Section 9.

8.16 If leakage occurs, carefully disassemble the pump components from the container and identify possible causes for the leakage (for example: damaged seal surface, poorly molded neck-finish on the container, and so forth.). Report findings in Section 9.

9. Report

9.1 Report the following information:

9.1.1 Product description, container and type and model of the pump dispenser being tested,

9.1.2 Number of defective packages,

9.1.3 Number of packages,

9.1.4 Leakage location on each package,

9.1.5 Reason or possible reason for the leakage to occur for each location cited, and

9.1.6 The method followed, A or B.

10. Precision and Bias

10.1 No statement is made about either the precision or bias of these methods since results merely state whether or not there is conformance to the criteria specified in the procedure.

11. Keywords

11.1 container leakage; mechanical pump dispenser leakage; vacuum leakage test