



Designation: D 6633 – 01

Standard Test Method for Basic Functional Stability of a Mechanical Pump Dispenser¹

This standard is issued under the fixed designation D 6633; 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 determination of the basic functional stability of a mechanical pump dispenser with a consumer-type product.

1.2 This test method covers accelerated usage evaluations of mechanical pump dispensers (spray or flow types) with a consumer-type product.

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.* Specific precautions are given in Section 5.

2. Referenced Documents

2.1 ASTM Standards:

D 2063 Test Methods for Measurement of Torque Retention for Packages with Continuous Thread Closures²

D 3890 Test Method for Number of Strokes to Prime a Mechanical Pump Dispenser³

D 4332 Practice for Conditioning Containers, Packages, or Packaging Components for Testing²

D 4336 Test Method for Determination of Output per Stroke of a Mechanical Pump Dispenser³

E 122 Practice for Calculating Sample Size to Estimate with a Specified Tolerable Error the Average for a Characteristic of a Lot or Process⁴

3. Significance and Use

3.1 This test method is used for determining the accelerated usage of a mechanical pump dispenser for consumer usage.

4. Apparatus

4.1 *Containers*, that will allow the mechanical pump dispenser to be affixed to them (Note 1) and also be capable of containing product for a period of time at various environmental conditions (Note 2). A minimum of 12 is recommended.

NOTE 1—If possible, the actual container to be marketed should be used.

NOTE 2—The number of containers is arbitrary and can be changed according to need.

4.2 *Mechanical Pump Dispensers*, a minimum of 12 units or a minimum of 6 units per environmental variable selected from 4.5.

4.3 *Product*, a sufficient amount to fill the number of containers in accordance with 4.1.

4.4 *Stereo/Zoom Microscope*, capable of magnification up through 30×, and preferably with a camera attached for permanent record keeping.

4.5 *Environments*, where the mechanical pump dispenser and product will be kept during the test period.

4.5.1 *Ambient Area*, maintained at $23 \pm 3^{\circ}\text{C}$ ($73 \pm 5.4^{\circ}\text{F}$).

4.5.2 *Oven* (45°C), maintained at $45 \pm 3^{\circ}\text{C}$ ($113 \pm 5.4^{\circ}\text{F}$).

4.5.3 *Optional: Cycle Chamber*, alternating 5 to 50°C (41 to 122°F) every 24 h.

5. Precautions

5.1 Appropriate handling considerations should be given to flammable, toxic, caustic, or other potentially hazardous material used. When testing at any temperature, safety should be the number one consideration and special attention should be used on the flash points of the products tested.

6. Sampling

6.1 Based upon the desired precision, sampling shall be performed in accordance with Practice E 122.

6.2 In the absence of any special sampling plan, performance shall be based on not less than the number of representative specimens exposed to any of the environmental conditions as specified in Section 9.

7. Test Specimen

7.1 Test specimens shall be clean, dry and previously unused mechanical pump dispensers.

8. Conditioning

8.1 If possible, condition the test specimens at $23 \pm 3^{\circ}\text{C}$ ($73 \pm 5.4^{\circ}\text{F}$) and $50 \pm 5\%$ Relative humidity of not less than 24 h prior to test shall be in accordance with the procedures of Practice D 4332. If the test specimens are not conditioned at

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.

Current edition approved Feb. 10, 2001. Published April 2001.

² *Annual Book of ASTM Standards*, Vol 15.09.

³ Discontinued 1995, see 1995 *Annual Book of ASTM Standards*, Vol 15.09.

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

the recommended temperature and humidity, this should be noted in the test report discussed in 1.1.

9. Test Specimen Preparation

9.1 Prepare a minimum of 12 mechanical pump dispensers with product and containers to be used for accelerated usage evaluation.

9.1.1 Affix the mechanical pump dispensers to containers sufficiently filled with product. Torque the mechanical pump dispensers securely to prevent leakage between the container and closure in accordance with Test Method D 2063. The level of product in the container should represent the level used for commercial use.

NOTE 3—It is extremely important that the pumps are applied to the containers with the minimal recommended torque load so that the worst case for detecting leakage is observed.

9.1.2 If any mechanical pump dispenser is defective it should be replaced and reported in 11.1 as to the type of defect (for example, mechanical pump dispenser would not prime).

9.1.3 Label all of the assembled units with the product name, any safety hazards for the product, name of the technician completing the test, and the test number or means of identifying the test along with the following:

9.1.3.1 Minimum 3 units labeled, “Upright, Ambient.”

9.1.3.2 Minimum 3 units labeled, “Upright, Oven 45°C.”

9.1.3.3 Optional: Minimum 3 units labeled, “Upright, Cycle Chamber.”

9.1.3.4 Minimum 3 units labeled “On-Side, Ambient.”

9.1.3.5 Minimum 3 units labeled, “On-Side, Oven 45°C.”

9.1.3.6 Optional: Minimum 3 units labeled “On-Side, Cycle Chamber.”

10. Procedure

10.1 Test each mechanical pump dispenser for strokes to prime in accordance with Test Method D 3890. Report the findings in 11.1.

10.2 Test each mechanical pump dispenser for output per stroke in accordance with Test Methods D 4336. Visually inspect the spray or flow of the product to ensure that no obstructions are present. Replace any non-functioning mechanical pump dispensers. Report the findings in 11.1.

10.3 Place all of the test specimens as prepared in 9.1 in their respective environments as indicated by the appropriate label on each unit. Specimens labeled “On-Side” should be placed with the orifice in the actuator facing down. If the mechanical pump dispensers use a protective hood or overcap, these test specimens should be stored with their protective devices in place. If the mechanical pump dispensers have a locking feature, these test specimens should be stored in the locked position during storage and unlocked for testing.

10.4 Three times a week (generally Monday, Wednesday, and Friday), for a period of four weeks, remove all of the test specimens from their respective environments.

10.5 Allow the temperature of the test specimens to equilibrate (generally 4 to 6 h) to ambient temperature prior to the actual evaluations.

10.6 Evaluate the primed mechanical pump dispensers for each of the following parameters:

10.6.1 *Leakage*—Visually inspect for the presence of product on the outside of either the mechanical pump dispenser or the container. If any test specimen exhibits a high degree of leakage, discontinue any additional testing with that particular mechanical pump dispenser and report the findings in 11.1.

10.6.2 *Retention of Prime*—Fully stroke each mechanical pump dispenser to determine if the mechanical pump dispenser has retained its prime. If any test specimen has lost prime and it is unable to be reprimed, then discontinue any additional testing with that particular mechanical pump dispenser and report the findings in 11.1.

NOTE 4—If the mechanical pump dispenser fails to re-prime as a result of a clog, then try cleaning in accordance with 10.6.3 before concluding the test.

10.6.3 *Clogging*—Visually inspect the orifice of each mechanical pump dispenser for the presence of product, either as is, or in a dried state and report the findings in 11.1. If the pump exhibits a high degree of clogging, which interferes with the performance of the mechanical pump dispenser, try removing the dried product from off the face of the orifice with your fingernail. If this does not make a difference, try cleaning by placing the clogged mechanical pump dispenser under warm running water for 1 min. If this does not remedy the clog and results in an unusable mechanical pump dispenser, discontinue any additional testing with that particular mechanical pump dispenser and report the findings in 11.1.

10.6.4 *Output per Stroke*—Determine the output per stroke (in accordance with Test Methods D 4336) of each mechanical pump dispenser per D 4336—Gravimetric Method. If any unacceptable delivery rate results, discontinue any additional testing with that particular mechanical pump dispenser and report the findings in 11.1.

10.7 Upon completion of the testing outlined in 9.1, return all functioning test specimens to their respective environments for continued testing at the next scheduled time interval.

10.8 Retain all test specimens that were discontinued from testing because of one or more defects. Save these if future examination is required.

11. Report

11.1 Report the following information:

11.1.1 Description of the mechanical pump dispenser (supplier, type, closure size, diptube length),

11.1.2 Identification of the product used,

11.1.3 Statement to the effect that the tests were made in compliance with this test method along with the:

11.1.3.1 Name of the technician completing the test, and

11.1.3.2 Date of report along with dates for the test period.

11.1.4 Detailed record of test on each mechanical pump dispenser,

11.1.4.1 When a mechanical pump dispenser was discontinued from additional testing and the nature of its discontinuance, and

11.1.4.2 Any observations or recommendations that may assist in correcting the various defects report upon.

11.1.4.3 Data for each package on strokes to prime and delivery rate. Identify any patterns or trends seen in the delivery rate of the packages during the test.