Designation: D4335 – 99 (Reapproved 2010)

Standard Test Method for Determination of Component Retention of a Mechanical Pump Dispenser[1]

This standard is issued under the fixed designation D4335; 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 force required to remove the hood and the actuator from a mechanical dispensing pump.

1.2 *This standard may involve hazardous materials, operations, and equipment. 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 consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D618 Practice for Conditioning Plastics for Testing

3. Significance and Use

3.1 This test method may be used to establish performance specifications.

3.2 This test method may be used to establish quality control assessment.

4. Apparatus

4.1 *Test Stand*—The test apparatus shall be capable of applying a smoothly increasing load to the test specimen until the component is separated from the pump assembly.

NOTE 1—The condition of 4.1 is fulfilled by most motor driven tensile strength testers including constant rate of elongation testers.

NOTE 2—The test standard should be equipped with a maximum-force indicator.

4.2 *Fixtures,* to hold the mechanical pump dispenser.

4.2.1 The fixtures must allow no slippage between the test specimen and the fixture, so that distortion is avoided.

4.2.2 The fixtures for the test apparatus may be custom-made for this test.

5. Sampling

5.1 Select an appropriate number of dry, unused pump dispensers at random for precision and accuracy desired. Use of 10 test specimens is recommended, but a minimum of three is acceptable.

6. Test Specimen

6.1 Test specimens shall be clean, dry, and previously unused mechanical pump dispensers assembled in the same manner as in production.

7. Conditioning

7.1 If possible, condition the test specimens 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 (see 9.1).

8. Procedure

8.1 Attach fixtures to the test stand in accordance with the manufacturer's instructions or in a manner consistent with the pump's geometry.

8.2 Adjust the test stand so that there is no force acting on the specimen.

NOTE 3—At this time, there should be a zero reading on the force gage.

8.3 *Manual Method:*

8.3.1 Place the pump assembly into the fixture.

8.3.2 Grasp the component to be separated in the hand.

8.3.3 Pull the component as slowly as possible, avoiding quick, jerking actions.

8.3.4 Continue to pull the component until it separates from the assembly.

8.3.5 Observe and record the maximum force, N (lb), required to separate the component from the assembly.

8.4 *Machine Method:*

8.4.1 Place the pump assembly into the fixture.

8.4.2 Secure the other component to the movable crosshead.

[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.

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8.4.3 Operate the test stand at a rate of 250 mm/min (10 in./min).

8.4.4 Stop the machine when the component has separated from the assembly.

8.4.5 Observe and record the maximum force, N (lb), required to separate the component from the assembly.

9. Report

9.1 The report shall include the following:

9.1.1 Complete identification of the component tested, including materials of construction, size, and manufacturer's code and date of manufacture, if known,

9.1.2 Number of specimens tested,

9.1.3 Number of test specimens that were separated from the assembly,

9.1.4 Mean, minimum, maximum, and standard deviation of forces required to separate the components from the assembly,

9.1.5 Special storage conditions, if applicable,

9.1.6 Description of the test apparatus, and

9.1.7 Method used, whether manual or machine (see 8.3 and 8.4).

10. Precision and Bias

10.1 *Precision*—The precision of Test Method D4335 is highly dependent on the interference requirements of the particular pump components tested. One laboratory has investigated one particular pump actuator removed from one particular pump piston with 82 replicate tests, yielding an average of 6.24 lbf with a range of 9.0 to 4.6 lbf and a standard deviation of 0.95 lbf. Other pump component assemblies will have other averages of retention and will have more or less variability between replicate tests. Users of this test method are encouraged to reference historical files of previous tests of similar pump component assemblies for an estimate of within-laboratory repeatability. Due to this varying component interference requirement dependency, further investigation of repeatability and reproducibility is not practicable.

10.2 *Bias*—Test Method D4335 has no bias because an accepted reference or referee value is not available.

11. Keywords

11.1 component; mechanical pump dispenser; retention

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