Designation: D3890 – 05 (Reapproved 2010)

Standard Test Method for Number of Strokes to Prime a Mechanical Pump Dispenser[1]

This standard is issued under the fixed designation D3890; 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 number of actuations required to prime a pump dispenser (spray and flow types) with a consumer-type product.

1.2 *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. Significance and Use

2.1 This test method can be used to visually compare priming characteristics of different pump dispensers and different products.

2.2 This test method is suitable for establishing specifications for both the pump dispenser and the final package.

3. Apparatus

3.1 No apparatus is required, although a mechanical device for actuating the pump dispenser may be used.

4. Sampling

4.1 Select an appropriate number of dry, unused pump dispensers at random for the precision and accuracy desired. A number of ten test specimens are recommended, but a minimum of three is acceptable.

5. Conditioning

5.1 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 discussed in 8.1.

5.2 Test pumps should be tested no sooner than 24 h after assembly when possible. If the pumps are not conditioned at the recommended time, this should be noted in the test report discussed in 8.1.

6. Test Specimens

6.1 For each test specimen, select a container to which the pump dispenser will be attached during the test. Since the dip tube length affects the number of strokes to prime, the actual bottle of the final package is recommended for testing.

7. Procedure

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

7.2 Attach the pump dispenser securely to the container. The pump should be in the off, locked, or closed position. Take care not to actuate the pump dispenser during this step.

NOTE 1—If the actuator is placed onto the pump after the pump has been secured onto the container, then report this additional stroke in the final results in 8.1.

NOTE 2—If an actuation is required when opening or unlocking the pump, then report this additional actuation in the test report discussed in 8.1.

7.3 If the pump dispenser is equipped with an overcap or locking feature, remove or release the feature to permit the pump dispenser to be in the operable mode.

7.4 If the pump dispenser has a variable output-per-stroke feature, make an appropriate adjustment to achieve the desired output-per-stroke at this time. Report this desired dosage in 8.1.

7.5 Actuate the pump dispenser to its fullest extent with smooth, firm, and even pressure. Allow the pump mechanism to fully return before beginning the next stroke.

NOTE 3—Depending on the venting system, some mechanical pump dispensers can have variation in the number of strokes-to-prime due to the time that the priming vent is opened. It is suggested that a rate of 90 ± 15 strokes per minute be used. For some viscous products, this rate may be too fast for the mechanical pump dispenser to fully return. If the rate of actuation is outside of this range—faster or slower, report in 8.1.

7.6 Record the number of full strokes until the first full discharge of product is observed.

NOTE 4—If the visual determination of the first full stroke is not accurate enough, the amount of product dispensed by the mechanical pump dispenser may be weighed after each stroke, and the amount dispensed would be determined by subtracting the post-stroke weight from the pre-stroke weight. The strokes-to-prime number to be recorded would then be the count value that shows the first consistent weight dispensed.

[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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NOTE 5—If the pump does not prime within 25 strokes, that pump should be inspected for the cause of not priming. This pump should be reported in 8, but not included in the statistical results.

8. Report

8.1 Report the following information:

8.1.1 Product description, type of pump dispenser being tested, dip tube length used, and for variable dosage pumps, the dosage selected,

8.1.2 Mean, maximum, minimum, and standard deviation values required to prime the pump dispensers, and

8.1.3 The rate actuation if outside the specified range.

9. Precision and Bias

9.1 *Precision*—The precision of Test Method D3890 is highly dependent on the particular pump style and contents tested. One laboratory has investigated one particular pump style and a lotion product with 100 replicate tests, yielding an average of 8.59 strokes to prime with a range of 7 to 10 strokes and a standard deviation of 0.66 strokes. Other pumps and contents will have other averages of strokes to prime and will have more or less variability between replicate tests. Users of this test method are suggested to reference historical files of previous tests of similar pumps and contents for an estimate of within–laboratory repeatability. The committee believes that because of this strong product and pump style dependency, further investigation of repeatability and reproducibility is not practicable.

9.2 *Bias*—Test Method D3890 has no bias because an accepted reference or referee value is not available.

10. Keywords

10.1 dispensing; mechanical pump dispenser; strokes-to-prime