



Designation: D6534 – 05

Standard Test Method for Determining the Peak Force-to-Actuate of a Mechanical Pump Dispenser¹

This standard is issued under the fixed designation D6534; 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 peak force-to-actuate, sometimes called force-to-actuate (FTA), of a mechanical pump dispenser.

1.2 The values stated in SI units are to be regarded as the standard. The inch-pound units given in parentheses are for information only.

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 precautionary statements are given in Section 5.

2. Referenced Documents

2.1 *ASTM Standards*:²

D3890 Test Method for Number of Strokes to Prime a Mechanical Pump Dispenser

3. Significance and Use

3.1 This test method can be used to compare the peak force-to-actuate performance of different mechanical pump dispensers.

3.2 This test method can be used to determine the perceived ease of use of a mechanical pump dispenser.

3.3 This test method can be used to determine the peak force-to-actuate of a mechanical pump dispenser.

4. Apparatus

4.1 *Motorized Compression Tester, or Custom Force-to-Action Machine*, with the capability to actuate the mechanical pump dispenser at a constant velocity and adjustable stroke lengths while accurately measuring the resulting force (that is, load cell).

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.

NOTE 1—Since the velocity during actuation will affect the FTA of certain mechanical pump dispenser designs, care must be taken in selecting the correct type of equipment with the sufficient actuation velocity.

4.2 A device connected to the compression tester that can display the resulting force in newtons (N) or pounds force (lbf) of 0.1 accuracy.

4.3 A means to rigidly hold the mechanical pump dispenser during testing (that is, glass bottle or a holding fixture; see Fig. 1).

5. Precautions

5.1 Appropriate handling considerations should be given to flammable, toxic, caustic, or other potentially hazardous materials used.

5.2 Appropriate operating considerations should be taken with pinch points on the motorized compression tester.

5.3 Ensure that the exit orifice of the mechanical pump dispenser is pointed away from the operator and other people.

5.4 Ensure that the motorized compression tester is properly calibrated.

5.5 *Actuation Rate for Finger Pumps*—Care should be taken when selecting the travel speed of the ram. For some mechanical pump dispenser styles, the speed of actuation and length of stroke can affect the peak force to actuate. As a rule of thumb, mechanical pump dispensers with a stroke length of 7 mm or greater should use an actuation velocity of 35 to 75 mm per second, while mechanical pump dispensers with a stroke length of less than 7 mm should use an actuation velocity of 35 mm per second or less. Especially for fine mist spray pumps, the above mentioned rates are preferred. A different rate may be used; however, the true force-to-actuate during use may not be measured. The actuation rate used should be recorded in 10.

5.6 *Actuation Rate for Trigger Pumps*—Actuation rate for trigger sprayers to be 90 strokes per min.

6. Sampling

6.1 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.