



Designation: D3332 – 99 (Reapproved 2023)

Standard Test Methods for Mechanical-Shock Fragility of Products, Using Shock Machines¹

This standard is issued under the fixed designation D3332; 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 These test methods cover determination of the shock fragility of products. This fragility information may be used in designing shipping containers for transporting the products. It may also be used to improve product ruggedness. Unit or consumer packages, which are transported within an outer container, are considered to be the product for the purposes of these test methods. Two test methods are outlined, as follows:

1.1.1 Test Method A is used first, to determine the product's critical velocity change.

1.1.2 Test Method B is used second, to determine the product's critical acceleration.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* For specific precautionary statements, see Section 6.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

D996 Terminology of Packaging and Distribution Environments

¹ These test methods are under the jurisdiction of ASTM Committee D10 on Packaging and are the direct responsibility of Subcommittee D10.13 on Interior Packaging.

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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.

D2463 Test Method for Drop Impact Resistance of Blow-Molded Thermoplastic Containers

D3580 Test Methods for Vibration (Vertical Linear Motion) Test of Products

D4332 Practice for Conditioning Containers, Packages, or Packaging Components for Testing

D5112 Test Method for Vibration (Horizontal Linear Motion) Test of Products

E122 Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process

E680 Test Method for Drop Weight Impact Sensitivity of Solid-Phase Hazardous Materials

3. Terminology

3.1 *Definitions*—General definitions for packing and distribution are found in Terminology **D996**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *acceleration of gravity* (g)—386.1 in./s² (9.806 m/s²).

3.2.2 *critical acceleration* (A_c)—the maximum-faired acceleration level for a minimum velocity change of 1.57 ΔV_c (see **9.3**), above which product failure (or damage) occurs. A product usually has a different critical acceleration for each direction in which it is tested.

3.2.3 *critical velocity change* (V_c)—the velocity change (see **9.2**) below which product failure is unaffected by shock-pulse maximum-faired acceleration or waveform. A product usually has a different critical velocity change for each direction in which it is tested.

3.2.4 *damage*—product failure that occurs during a shock test. Damage can render the product unacceptable because it becomes inoperable or fails to meet performance specifications when its appearance is unacceptably altered, or some combination of these failure modes occurs.

3.2.5 *damage boundary*—See **Annex A3**.

3.2.6 *fairing*—The graphical smoothing of the amplitude of a recorded pulse still containing high frequency components even though electronic filtering may have been performed. This amplitude is used to evaluate the basic recorded pulse features with respect to the specified pulse. (see **Figs. A1.1 and A2.1**)