



Standard Test Methods for Internal Pressure Strength of Glass Containers¹

This standard is issued under the fixed designation C 147; 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 the determination of the breaking strength of glass containers when subjected to internal pressure. These test methods are intended to determine the pressure strength of containers manufactured to contain products reasonably expected to develop a sustained pressure of 138 kPa (20 psi) or greater, after processing. Two test methods are covered as follows:

	Sections
Test Method A—Application of Uniform Internal Pressure for a Predetermined Period	5-7
Test Method B—Application of Internal Pressure Increasing at a Predetermined Constant Rate	8-10

1.2 The values stated in SI units are to be regarded as the standard. The values 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.*

2. Referenced Documents

- 2.1 *ASTM Standards:*
C 224 Practice for Sampling Glass Containers²
2.2 *ASTM Adjuncts:*
C 147 Single-head hydraulic testing machine (8 blueprints)³

3. Sampling

3.1 Methods of sampling a minimum lot from a group of containers of a given type are given in Practice C 224, for the various situations to which it may apply.

4. Precision and Bias

4.1 Statements regarding either precision or bias of the internal pressure test results are not possible because suitable

¹ These test methods are under the jurisdiction of ASTM Committee C-14 on Glass and Glass Products and are the direct responsibility of Subcommittee C14.07 on Glass Containers.

Current edition approved Jan. 31, 1986. Published March 1986. Originally published as C 147 – 39 T. Last previous edition C 147 – 76 (1981)¹.

² *Annual Book of ASTM Standards*, Vol 15.02.

³ Single-head automatic sustained pressure testing machine developed by American Glass Research, Inc., Butler, PA, meets these requirements for durations greater than 15 s. Detailed working drawings of this machine are available from ASTM Headquarters. Order Adjunct No. 12-301470-00. An increment pressure tester developed by the same laboratory is suitable for shorter durations.

internal pressure reference test materials are not available.

4.2 *Test Method A*—The pressure test precision is within one half the incremental step size used at failure. Pressure test bias is generally within $\pm 1\%$ of full scale.

4.3 *Test Method B*—The pressure test precision is within ± 1 psi (7 kPa). Pressure test bias is generally within \pm % of full scale.

TEST METHOD A—APPLICATION OF UNIFORM INTERNAL PRESSURE FOR A PREDETERMINED PERIOD

5. Apparatus

5.1 The apparatus³ shall embody the following principles:

5.1.1 The bottles to be tested shall be held in such a manner that the bottle is not clamped, but is suspended from the *bead of the finish*.

5.1.2 There shall be a resilient sealing member that shall act with the sealing surface of the container to retain the pressurizing medium during the period of the test.

5.1.3 There shall be a means of applying fluid pressure to a predetermined level at a minimum rate of 69 MPa (10 000 psi)/min and of maintaining that pressure constant during the period of test. Applied incremental fluid pressure levels shall be provided extending over the range from 0.18 MPa (25 psi) to at least 2.41 MPa (350 psi). The applied fluid pressure level shall be reproducible to within $\pm 1\%$ of full scale.

5.1.4 An automatically controlled timing mechanism shall be built into the apparatus so that the container will be subject to uniform internal pressure for a predetermined period which shall be not less than 3 s nor more than 1 min (Note 1). The period of test shall be reproducible within $\pm 2\%$.

NOTE 1—For test durations between 3 s and 1 min, the actual pressure (P_t) can be converted to the 1-min pressure (P_{60}) calculated as follows:

$$P_{60} = \left(\frac{7.97 + 1.53 \log t}{10.69} \right) P_t \quad (1)$$

where t is the duration of the test in s. For instance, the actual pressure in a 3-s test would be multiplied by 0.81 in order to be equivalent to the pressure at a test period of 1 min.

6. Procedure

6.1 Fill the containers with water or other low-density liquid, if such is used as the medium for applying pressure.

6.2 Use one of the following test procedures, depending upon the purpose of the test:

6.2.1 *Pass Test*—Apply the internal test pressure and hold it