



Standard Practice for Pressure Decay Leak Test Method¹

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1. Scope

1.1 This practice describes a method for determining the leakage rate of a vessel subject to a positive pressure difference. The technique is based upon evaluation of the change of mass within the test object based on a pressure decay measurement. The pressure decay measurement uses the ideal gas equation of state and the measured pressures, temperatures, and time to determine the mass loss from the vessel. This method does not apply to deformable vessels.

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. Referenced Documents

2.1 *ASTM Standards:*²

E479 [Guide for Preparation of a Leak Testing Specification](#) (Withdrawn 2014)³

E543 [Specification for Agencies Performing Nondestructive Testing](#)

E1316 [Terminology for Nondestructive Examinations](#)

2.2 *ANSI/ASNT Standards:*⁴

ANSI/ASNT-CP-189 [Standard for Qualification and Certification of Nondestructive Testing Personnel](#)

SNT-TC-1A [Recommended Practice for Nondestructive Testing Personnel Qualification and Certification](#)

2.3 *AIA Document:*⁵

NAS-410 [Certification and Qualification of Nondestructive Testing Personnel](#)

2.4 *ASME Standards:*⁶

ASME Boiler and Pressure Vessel Code Section V Article 10 (paragraph T-1044)

2.5 *ISO Standards:*⁷

ISO/IEC Guide 98–3 [Uncertainty of Measurement — Part 3](#)

3. Terminology

3.1 *Definitions:*

3.1.1 *pressure decay test resolution*—the resolution of the test that can be derived from the test equipment specifications and the volume of the test vessel. The test resolution is determined by evaluation of the individual resolutions of the pressure measurement, temperature measurement, and time measurement for a known vessel volume. The method for determining the test resolution is given in [Annex A1](#).

3.1.2 *pressure decay test accuracy*—the test accuracy is the estimated accuracy of the test based on a combination of the measurement accuracies of contributing variables. The method for determining the test accuracy is given in [Annex A2](#).

4. Summary of Test Method

4.1 This practice requires a known volume and the use of the pressure rate of decay technique for quantitative measurement of leakage rates. The practice is written to be usable over a wide range of pressures and system volumes. This method is only applicable to the test of non-deformable volumes or devices. Test devices which may have significant changes in volume due to pressurization should not be tested with this method. The method requires the measurement of the system pressure and temperature as a function of time and as such requires that these measurements be made with calibrated instrumentation. The range of the measurement technique can vary significantly but is generally applicable in the range greater than 1×10^{-8} mol/s (2.2×10^{-4} std cc/s)

5. Significance and Use

5.1 The equipment, test duration, and technique should be determined before commencement of the test based on the

¹ This practice is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.08 on Leak Testing Method.

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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.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlington Ln., Columbus, OH 43228-0518, <http://www.asnt.org>.

⁵ Available from Aerospace Industries Association of America, Inc. (AIA), 1000 Wilson Blvd., Suite 1700, Arlington, VA 22209-3928, <http://www.aia-aerospace.org>.

⁶ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁷ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.