



Designation: E493/E493M – 11 (Reapproved 2022)

## Standard Practice for Leaks Using the Mass Spectrometer Leak Detector in the Inside-Out Testing Mode<sup>1</sup>

This standard is issued under the fixed designation E493/E493M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the U.S. Department of Defense.*

### 1. Scope

1.1 This practice<sup>2</sup> covers procedures for testing devices that are sealed prior to testing, such as semiconductors, hermetically enclosed relays, pyrotechnic devices, etc., for leakage through the walls of the enclosure. They may be used with various degrees of sensitivity (depending on the internal volume, the strength of the enclosure, the time available for preparation of test, and on the sorption characteristics of the enclosure material for helium). In general practice the sensitivity limits are from  $10^{-10}$  to  $10^{-6}$  Pa m<sup>3</sup>/s ( $10^{-9}$  standard cm<sup>3</sup>/s to  $10^{-5}$  standard cm<sup>3</sup>/s at 0°C) for helium, although these limits may be exceeded by several decades in either direction in some circumstances.

1.2 Two test methods are described:

1.2.1 *Test Method A*—Test part preparation by bombing.

1.2.2 *Test Method B*—Test part preparation by prefilling.

1.3 *Units*—The values stated in either SI or std-cc/sec units are to be regarded separately as standard. The values stated in each system may not be exact equivalents: therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.4 *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.*

1.5 *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 Recom-*

*mendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

2.1 *ASTM Standards*:<sup>3</sup>

[E1316 Terminology for Nondestructive Examinations](#)

2.2 *Other Documents*:

[SNT-TC-1A Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing](#)<sup>4</sup>

[ANSI/ASNT CP-189 ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel](#)<sup>4</sup>

[MIL-STD-410 Nondestructive Testing Personnel Qualification and Certification](#)<sup>5</sup>

[NAS-410 Certification and Qualification of Nondestructive Test Personnel](#)<sup>6</sup>

### 3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice, see Terminology [E1316](#), Section E.

### 4. Summary of Practice

4.1 The test methods covered in this practice require that the test part contain helium at some calculable pressure at the time of test. If the device cannot be sealed with a known pressure of helium inside, it is necessary to “bomb” the part in a helium pressure chamber in order to introduce helium into the test part if a leak exists.

4.2 After the test part has been subjected to helium pressurizing means, it is placed in an enclosure which is then evacuated and coupled to a mass spectrometer leak detector. In

<sup>1</sup> 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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<sup>2</sup> The inside-out testing mode is characterized by an external vacuum and internal pressure. This standard covers “evacuated,” “sealed with tracer,” and “air-sealed” testing procedures shown in Terminology [E1316](#).

<sup>3</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

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

<sup>5</sup> Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://dodssp.daps.dla.mil>.

<sup>6</sup> Available from Aerospace Industries Association of America, Inc. (AIA), 1000 Wilson Blvd., Suite 1700, Arlington, VA 22209-3928, <http://www.aia-aerospace.org>.