



Standard Test Methods for Leaks Using the Mass Spectrometer Leak Detector or Residual Gas Analyzer in the Tracer Probe Mode¹²

This standard is issued under the fixed designation E 498; 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.

This specification has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 These test methods cover procedures for testing and locating the sources of gas leaking at the rate of 4.5×10^{-14} mol/s (1×10^{-9} Std cm³/s)³ or greater. The test may be conducted on any object to be tested that can be evacuated and to the other side of which helium or other tracer gas may be applied.

1.2 Three test methods are described:

1.2.1 *Test Method A*—For the object under test capable of being evacuated, but having no inherent pumping capability.

1.2.2 *Test Method B*—For the object under test with integral pumping capability.

1.2.3 *Test Method C*—For the object under test as in Test Method B, in which the vacuum pumps of the object under test replace those normally used in the leak detector.

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.* A specific hazard statement can be found in 19.2.

2. Referenced Documents

2.1 ASTM Standards:

E 1316 Terminology for Nondestructive Examinations⁴

2.2 Other Documents:

SNT-TC-1A Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing⁵

¹ These test methods are under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.08 on Leak Testing.

Current edition approved Sept. 10, 1995. Published November 1995. Originally published as E 498 – 73. Last previous edition E 498 – 94.

² (Atmospheric pressure external, vacuum internal). This document covers the Tracer Probe Mode described in Terminology E 1316.

³ The gas temperature is referenced to 0°C. To convert to another gas reference temperature, T_{ref} , multiply the leak rate by $(T_{ref} + 273)/273$.

⁴ *Annual Book of ASTM Standards*, Vol 03.03.

⁵ Available from American Society for Nondestructive Testing, 1711 Arlingate Plaza, P.O. Box 28518, Columbus, OH 43228-0518.

ANSI/ASNT CP-189 ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel⁵

3. Terminology

3.1 *Definitions*—For definitions of terms used in this standard, see Terminology E 1316, Section E.

4. Summary of Test Methods

4.1 These test methods require a helium leak detector that is capable of detecting a leak of 4.5×10^{-15} mol/s (1×10^{-10} Std cm³/s).³

4.2 *Test Method A*—This test method is used to helium leak test objects that are capable of being evacuated to a reasonable test pressure by the leak detector pumps in an acceptable length of time. This requires that the object be clean and dry and usually no larger than a few cubic feet in volume. Also to cope with larger volumes or relatively “dirty” devices, auxiliary vacuum pumps having greater capacity than those in the mass spectrometer leak detector (MSLD) may be used in conjunction with the MSLD. The leak test sensitivity will be reduced under these conditions.

4.3 *Test Method B*—This test method is used to leak test equipment that can provide its own vacuum (that is, equipment that has a built-in pumping system) at least to a level of a few hundred pascals (a few torr) or lower.

4.4 *Test Method C*—When a vacuum system is capable of producing internal pressures of less than 2×10^{-2} Pa (2×10^{-4} torr) in the presence of leaks, these leaks may be located and evaluated by the use of either a residual gas analyzer (RGA) or by using the spectrometer tube and controls from a conventional MSLD, provided, of course, that the leakage is within the sensitivity range of the RGA or MSLD under the conditions existing in the vacuum system.

5. Personnel Qualification

5.1 It is recommended that personnel performing leak testing attend a dedicated training course on the subject and pass a written examination. The training course should be appropriate for NDT level II qualification according to Recommended