Designation: E499/E499M – 11 (Reapproved 2017)

Standard Practice for Leaks Using the Mass Spectrometer Leak Detector in the Detector Probe Mode[1,2]

This standard is issued under the fixed designation E499/E499M; 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 standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This practice covers procedures for testing and locating the sources of gas leaking at the rate of 1×10^{-7} Pa m^3/s (1×10^{-8} Std cm^3/s)[3] or greater. The test may be conducted on any device or component across which a pressure differential of helium or other suitable tracer gas may be created, and on which the effluent side of the leak to be tested is accessible for probing with the mass spectrometer sampling probe.

1.2 Two test methods are described:

1.2.1 *Test Method A*—Direct probing, and

1.2.2 *Test Method B*—Accumulation.

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 and health 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 Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[4]

E1316 Terminology for Nondestructive Examinations

2.2 *Other Documents:*

SNT-TC-1A Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing[5]

ANSI/ASNT CP-189 ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel[5]

3. Terminology

3.1 *Definitions*—For definitions of terms used in this standard, see Terminology E1316, Section E.

4. Summary of Practice

4.1 Section 1.8 of the Leakage Testing Handbook[6] will be of value to some users in determining which leak test method to use.

4.2 The test methods covered in this practice require a leak detector with a full-scale readout of at least 1×10^{-6} Pa m^3/s (1×10^{-7} Std cm^3/s)[3] on the most sensitive range, a maximum 1-min drift of zero and sensitivity of ±5 % of full scale on this range, and ±2 % or less on others (see 7.1). The above sensitivities are those obtained by probing an actual standard leak in atmosphere with the detector, or sampling, probe, and *not* the sensitivity of the detector to a standard leak attached directly to the vacuum system.

4.3 *Test Method A, Direct Probing* (see Fig. 1), is the simplest test, and may be used in parts of any size, requiring only that a tracer gas pressure be created across the area to be tested, and the searching of the atmospheric side of the area be with the detector probe. This test method detects leakage and

[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] (Atmospheric pressure external, pressure above atmospheric internal). This document covers the Detector Probe Mode described in Guide E432.

[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] 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.

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

[6] Marr, J. William, "Leakage Testing Handbook," prepared for Liquid Propulsion Section, Jet Propulsion Laboratory, National Aeronautics and Space Administration, Pasadena, CA, Contract NAS 7-396, June 1961.

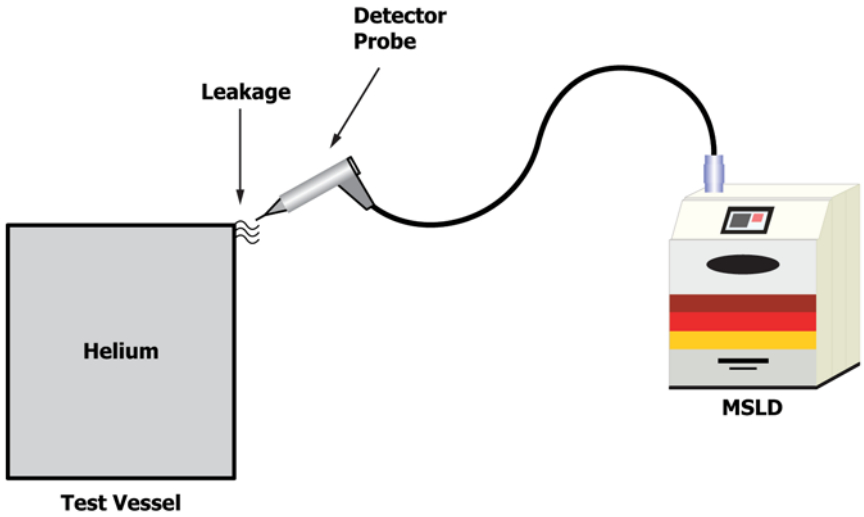
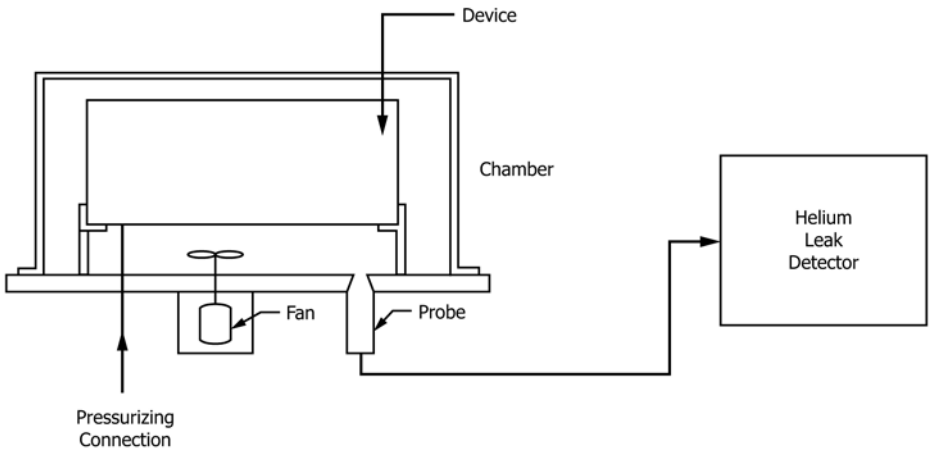
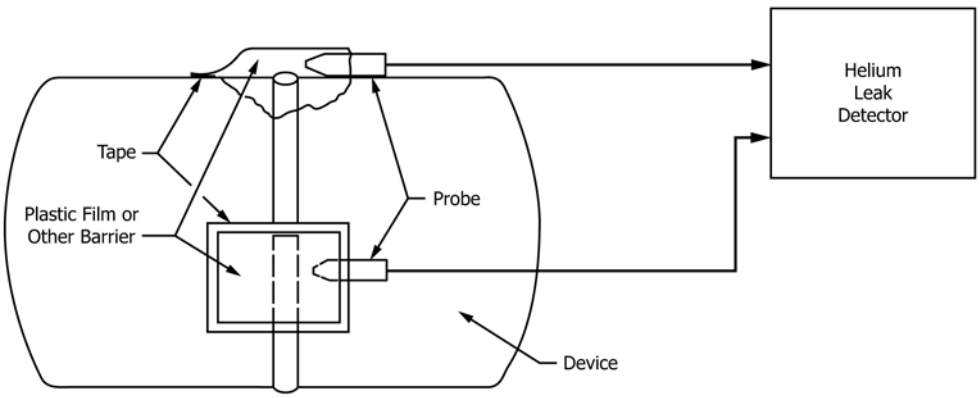


FIG. 1 Method A



a) Accumulation Leak Test, Complete Device in Chamber



b) Accumulation Leak Test, Flexible Shroud over a Small Portion of Device

FIG. 2 Method B

its source or sources. Experience has shown that leak testing down to 1×10^{-5} Pa m^3/s (1×10^{-6} Std cm^3/s)[3] in factory environments will usually be satisfactory if reasonable precautions against releasing gas like the tracer gas in the test area are observed, and the effects of other interferences (Section 6) are considered.