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Superseding ARP726

Universal Leak Detector

FOREWORD

Changes in this revision are format/editorial only.

1. SCOPE:

This recommended practice covers a self-contained detection system which is capable of pressurizing a closed system up to 70 psig with halogen (tracer) gas and up to 3500 psig with nitrogen.

1.1 An external tracer gas supply may be used to increase the capacity of the system. The detector shall be capable of detecting leaks as small as .05 ounce of tracer gas per year, with a system pressure of 70 psig or less.

1.2 Purpose:

The purpose of this document is to provide a recommended practice for the design of a universal leak detector which will pressurize a closed system with a mixture of inert and tracer gas and provide a probe and detector to indicate location and rate of system leakage with a high degree of accuracy.

2. REFERENCES:

The following military specifications may be applicable and provide useful information:

MIL-N-6011 Nitrogen Liquid and Gas  
MIL-S-8512 Support Equipment, Aeronautical, Special General Specification for the Design of  
MIL-D-70327 Drawing, Engineering and Associated Lists  
MIL-M-8090 Mobility Requirements, Ground Support Equipment, General Specification for  
MS 33586 Metals - Definition of Dissimilar  
MIL-H-5593 Hose, Aircraft Low Pressure, Flexible  
MIL-H-8788 Hose, Hydraulic and Pneumatic High Pressure  
Handbook H28 Screw Threads Standards for Federal Services

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3. GENERAL REQUIREMENTS:

3.1 Material and Workmanship:

3.1.1 Material: Material specified for use in fabrication shall be of the best commercial quality and suitable for the purpose.

3.1.2 Workmanship: All details of workmanship specified on the drawings shall be in accordance with high-grade commercial practices. The article produced shall be free of defects which might affect its serviceability or function.

4. SPECIFIC REQUIREMENTS:

4.1 General:

The console shall be capable of controlling the pressurization of a closed system with tracer gas and nitrogen gas, within maximum pressures herein specified. The assembly shall be capable of monitoring the system pressures.

4.2 Mobility:

The console assembly shall have the capability of being easily moved on casters. The console assembly shall be able to pass thru a 30 inch wide opening.

4.3 Design Configuration:

Design configuration shall be of a mobile console concept (see Figures 1 and 2). The assembly shall contain, but not be limited to the following:

4.3.1 Console: The console shall contain hardware necessary to control pressurization of the system being leak-tested, detect the presence of leaks, and vent the system being checked. The console shall have adequate storage space to house all components such as hoses, cables, and instruments.

4.3.2 Standard Control Unit: The console shall contain a standard control unit, including a voltage regulator, a vibrator type air pump, an audible alarm, and a control panel.

4.3.3 Detector: The tracer gas detector shall be a hand-held detector used as a probe for passing over welds, seams, joints and other areas of potential leakage.

4.3.4 Nitrogen Gas Regulator: The nitrogen gas regulator shall be capable of regulating nitrogen gas pressure of 3600 psig to an outlet pressure of  $100 \pm 5$  psig,  $500 \pm 20$  psig,  $1500 \pm 50$  psig and  $3500 \pm 75$  psig.

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- 4.3.5 Tracer Gas Regulator: The tracer gas regulator shall be capable of regulating a self-contained tracer gas pressure source of 75 psig.
- 4.3.6 Metering Valves: The metering valves shall be capable of controlling the rate of flow of either the tracer or nitrogen gas into the system undergoing pressurization.
- 4.3.7 Pressure Relief Valve: Pressure relief shall be preset and sealed at a pressure compatible with the system being pressurized. These valves shall be connected to the pressurization line so that the system pressure shall not exceed allowable limits.
- 4.3.8 Test Gage: Test gages graduated from zero (0) psig to maximum gage pressure<sup>1</sup> shall be mounted in the control panel to indicate the pressure in the system being leak tested.
- 4.3.9 Filters: Filters allowing passage of 10 micron (maximum) size particles shall be incorporated in the upstream side of the gas pressure regulators to avoid system contamination.
- 4.3.10 Power Cables: Power cables of 25-ft minimum length shall be provided to carry electrical power single-phase 115-VAC 60-cycle power source and ground connection to the leak detector.
- 4.3.11 Pneumatic Hoses: The following pneumatic hoses, compatible with system pressurization, shall be included as part of the leak-detector assembly:
- 4.3.11.1 One 100-psig flexible hose, 50 feet long. This hose shall be used to pressurize the tracer gas portion of the system being leak tested.
- 4.3.11.2 Three 3500-psig flexible hoses, each 50 feet long. These hoses shall be used to:
- Pressurize the nitrogen portion of the system being leak-tested.
  - Transfer nitrogen gas from a 3500-psig source to the leak-detector assembly.
  - Allow the expulsion of the gases from the system after the leak has been completed.
  - Couplings used with the various pressure hose shall not be interchangeable with each other.
- 4.3.12 Tracer Gas: Space for one 10-pound bottle Halogen Tracer Gas (Freon-12-dichlorodifluoromethane  $\text{CCL}_2\text{F}_2$ )<sup>2</sup> shall be incorporated in the console assembly to provide charging of the system being leak-checked with tracer gas. An external connection to allow an increase in the gas capacity shall be provided.
- 4.3.13 Nitrogen Gas: Nitrogen gas for pressurizing the system to be tested shall be facility-supplied.

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1. One gage for each range of test pressures indicated in paragraph 4.3.4.  
2. Commercially available.

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### 4.4 Inspection:

4.4.1 Classification of Tests: The inspection and testing of the leak detector shall be classified as "acceptance testing".

4.4.2 Individual Tests: The leak detector shall be subjected to the following tests, as described under 4.5:

4.4.2.1 Examination of Product

4.4.2.2 Functional Tests

4.4.2.3 Visual Inspection

### 4.5 Test Methods:

The test methods shall be as follows:

4.5.1 Examination of Product: Each component of the leak detector shall be examined for conformance to applicable drawings and specifications.

4.5.2 Functional Tests: The leak detector shall be subjected to functional tests at the supplier's facility to insure that the equipment meets the requirements set forth in Section 4 of this document.

4.5.3 Visual Inspection: Visually inspect the Leak Detector Assembly for evidence of handling or shipping damage.

### 4.6 Facilities:

4.6.1 Test Power: The leak detector shall be tested within the range of 105 and 125 VAC and with frequencies within the range of 57 to 63 cps, single-phase. Where an alternate power source is available, a power converter is necessary to provide compatibility with facility power.

4.6.2 Facility Supplied Nitrogen Gas: Nitrogen gas shall be facility-supplied.

### 4.7 Precautions:

4.7.1 Do not use leak detector in explosive or combustible atmospheres.

4.7.2 Toxicity of Freon: Freon-12-dichlorodifluoromethane has been classified as non-toxic,<sup>1</sup> but may induce drowsiness or hypoxia if breathed exclusive of oxygen. Therefore, at completion of tests it shall be necessary to purge breathing oxygen systems with inert gas for one minute at each bleed point of the system. The purge method shall insure the evacuation of all Freon from the system.

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1. Reference: "Dangerous Properties of Industrial Materials" Author - N. Irving Sax, Reinhold Publishers, New York, 1957.

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4.7.3 Materials Incompatibility: The using agency shall evaluate the effect of the Halogen tracer gas used, as it may affect or degrade other materials in the system being exposed to Halogen gas.

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