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EIA STANDARD

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Air Leakage Test Procedure for Electrical Connectors

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(Revision of EIA-364-02B)

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(From Standards Proposal Number 4303, formulated under the cognizance of the CE-2.0 National Connector Standards Committee.)

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TEST PROCEDURE No. 02C

AIR LEAKAGE TEST PROCEDURE FOR ELECTRICAL CONNECTORS

(From EIA Standards Proposal No. 4303, formulated under the cognizance EIA CE-2.0 Committee on National Connector Standards, and previously published in EIA-364-02B.)

1 Introduction

1.1 Scope

This test procedure details a standard method to determine the integrity of the seal of the shell, insert and contact interfaces in an electrical connector.

1.2 Object

The air leakage test may be conducted as one of the tests in a sequential test plan, and after or during the exposure of the test specimen to a specified temperature. Basically, this procedure consists of establishing a pressure differential between the front and rear faces of a mounted connector and measuring the degree of leakage through the seals of the test specimen by means of a detection device located on the low pressure side of the test specimen. Leakage may be determined by either the hermetic seal or environmental seal test methods as specified herein.

1.2.1 Hermetic seal

Hermetically sealed connectors usually have contacts bonded to the connector by glass or other materials and permit a maximum leakage rate of gas such as 1×10^{-5} cm^3/s at 101.3 kPa (1 atm) or a lower maximum rate.

1.2.2 Environmental seal

An environmentally sealed connector is usually provided with gaskets, seals, potting or other devices to keep out moisture, dirt, air, or dust that might reduce its performance.

2 Test resources

2.1 Equipment

2.1.1 Hermetic seal

2.1.1.1 Pressure chamber, that provides for mounting of the test specimen by means of its flange on the chamber divider that separates low from high pressure with a gas tight seal. A means shall be provided for surrounding the high pressure side of the connector with a tracer gas for hermetic testing.

2.1.1.2 Pressure or vacuum pumps, or a pressure bottle with pressure control valves capable of achieving and maintaining the pressure differential specified.

2.1.1.3 Gages shall be provided in order to read the pressure and/or vacuum of the pressure differential between the front and rear faces of the connector during rest.

2.1.1.4 A mass spectrometer detector shall be used to read the tracer gas leakage rate through the connector.

2.1.1.5 The tracer gas shall be helium, argon, or a mixture of 90 percent nitrogen and 10 percent helium.

2.1.1.6 A suitable enclosure shall be used that will provide the specified temperature to the test specimen.

2.1.2 Environmental seal

2.1.2.1 Pressure chamber, that provides for mounting of the test specimen by means of its flange on the chamber divider that separates low from high pressure with a gas tight seal. The chamber shall be capable of maintaining the specified temperature and internal pressure as specified in the detail specification.

2.1.2.2 A suitable enclosure shall be used that will provide the specified temperature to the test specimen.

2.1.2.3 Pressurized air supply with suitable valves, regulators and plumbing to complete the equipment arrangement per figure 1. An alternative environmental seal test equipment setup per figure 2 may be used.

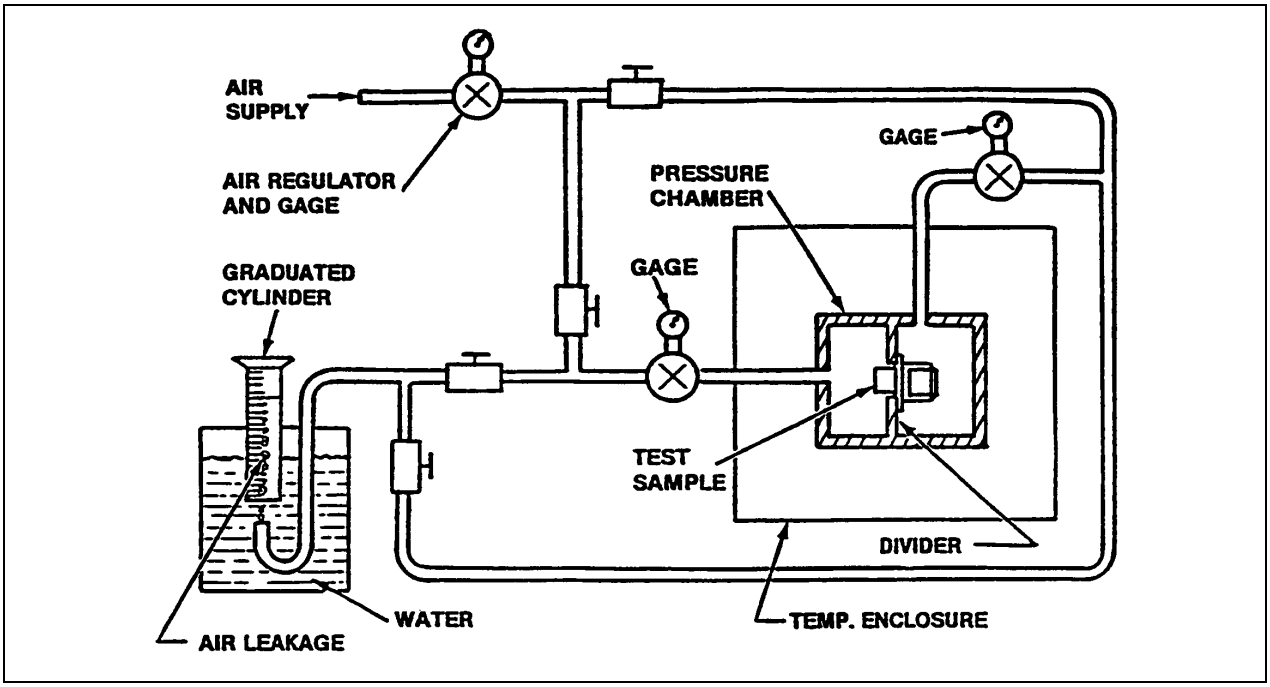

Figure 1 - Environmental seal test equipment arrangement

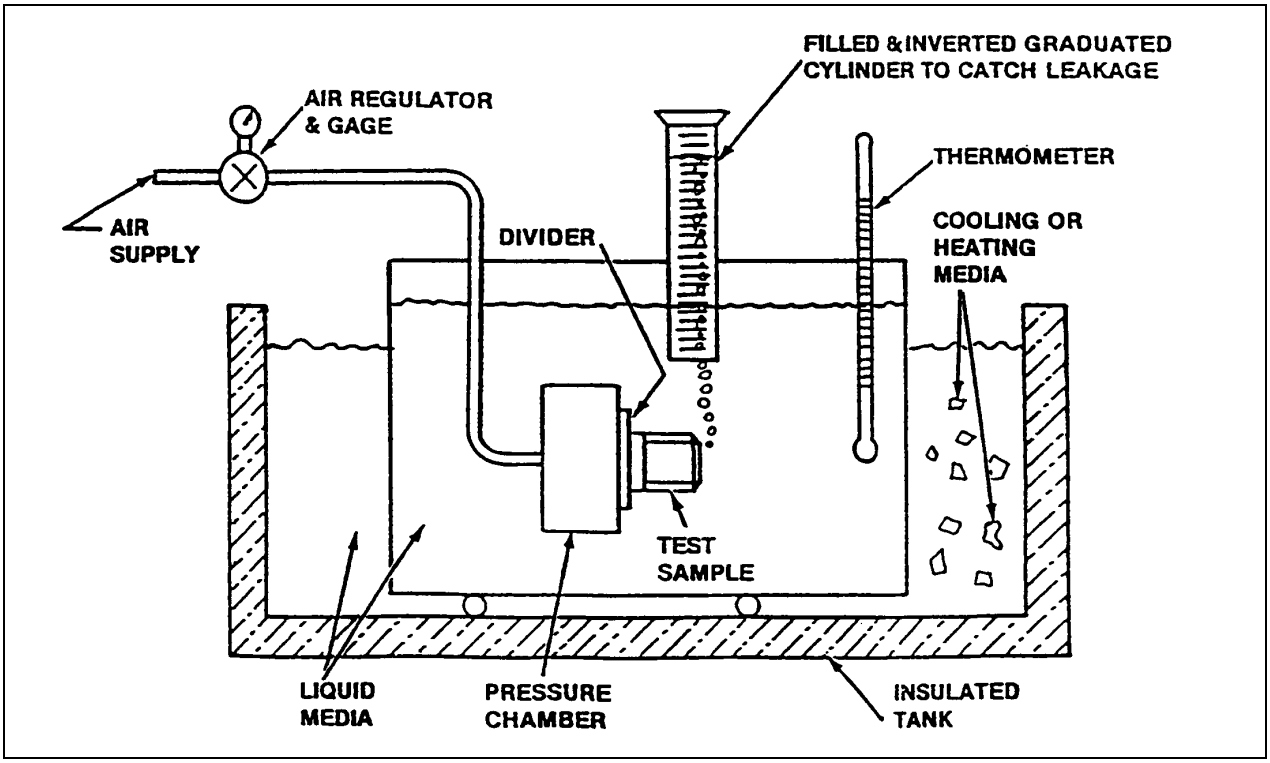

Figure 2 - Alternative environmental seal test equipment arrangement

2.1.2.4 Gage shall be provided to read the pressure differential between the front and rear faces of the connector during test.

2.1.2.5 Temperature gages or thermometers shall be used to ascertain the temperature environment of the test specimen.

2.1.2.6 Graduated cylinder: 25 mL.

2.1.2.7 For performance of the test at low temperature, it is necessary to purge the pipes with dry air before placing specimens into the low temperature chamber in order to avoid formation of condensation or ice, that may block the pipes and produce errors in the data.

3 Test specimen

3.1 Description

A test specimen shall consist of a connector assembly complete with wires, contacts, sealing plugs and accessories as specified in the referencing document.

3.2 Preparation

The wires shall be dressed in an axial manner so as not to impair the connector wire seal features and shall have their exposed ends sealed to preclude leakage through the conductors

4 Test procedure

4.1 Environmental conditions

Unless otherwise specified, tests shall be conducted at standard ambient conditions.

4.2. Mounting

The test specimen shall be mounted on the chamber divider that separates low from high pressure. A suitable opening shall be provided in the divider such that, with the aid of greases and/or sealing gaskets, a leak-proof junction is achieved between the test specimen and chamber divider. After mounting in the chamber, the test specimen shall be conditioned for at least 1/2 hour at the desired temperature before conducting the test.

4.3 Pressure application

The pressure differential between the front and rear faces of the connector shall be maintained at the specified value. Depending on the type of equipment used, this may be achieved by evacuation of one side of the chamber while maintaining atmospheric pressure at the other side, or pressurizing one side of the chamber with atmospheric pressure at the other side, or a combination of pressurizing one side of the chamber and partially evacuating the other side.

4.4 Leak detection

4.4.1 Leak detection for hermetic seal connectors

The leak detector shall be connected to or positioned at the low pressure or vacuum side of the chamber. When remote probes are used, a shroud may be used to envelop the test specimen to confine the gas emission. The tracer gas shall be introduced at the high pressure side of the chamber in such a manner that it surrounds the face of the test specimen. The leakage rate shall be measured for a minimum period of one (1) minute and recorded.

4.4.2 Leak detection for environmental seal connectors

The graduated cylinder shall be filled with liquid and then inverted over the air exit tube from the test specimen. The leakage rate shall be measured and recorded.

4.5 Test specimen orientation

Unless otherwise specified, the test specimen shall be tested with the flange and mating face of the test specimen exposed to the high pressure side of the chamber. When specified, the connector shall be reversed and leakage checked in the opposite (or both) directions.

5 Details to be specified

The following details shall be specified in the referencing document:

5.1 Initial measurements and conditions, if other than room ambient; see 4.1

5.2 Full description of test specimen; see 3.1

5.3 Manner in that specimen is to be prepared; see 3

5.4 Pressure differential required; see 2.1.1.2

5.5 Test specimen orientation and whether reverse testing is also required; see 4.5

5.6 Maximum allowable leakage rate; see 4.4

6 Test documentation

Documentation shall contain the details specified in clause 5, with any exceptions, and the following:

6.1 Title of test

6.2 Description of test specimen including fixturing, if applicable

6.3 Test equipment used, and date of last and next calibration

6.4 Test procedure used

6.5 Values and observations

6.5.1 Initial and final conditions

6.5.2 Leakage rate observed, comparison to connector specification requirements, whether specimens passed or failed

6.6 Name of operator and date of test

EIA Document Improvement Proposal

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