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EIA STANDARD

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Full Mating and Mating Stability Test Procedure for Electrical Connectors

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ELECTRONIC INDUSTRIES ALLIANCE

Electronic Components, Assemblies, Equipment & Supplies Association

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(From Standards Proposal No. 3659-B, formulated under the cognizance of the CE-2.0 National Connector Standards Committee.)

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TEST PROCEDURE No. 95

FULL MATING AND MATING STABILITY TEST PROCEDURE FOR ELECTRICAL CONNECTORS

(From EIA Standards Proposal No. 3659, formulated under the cognizance EIA CE-2.0 Committee on National Connector Standards.)

1 Introduction

1.1 Scope

This document defines methods to evaluate the coupled condition of a connector plug, with its mating receptacle. This procedure assesses the ability of a connector pair to remain fully mated after exposure to test conditions but not during exposure.

1.2 Object

This test procedure details a selection of standard methods to evaluate whether or not a connector is fully mated. The definition of "mated" may differ with connector designs. Whether or not a connector is fully mated may be of critical importance in the connector performing to its required level in field conditions where influences such as vibration can cause the coupling mechanism to "back off" from the fully mated condition.

1.3 Definitions

1.3.1 Fully mate

Mating of the connector pair to the full mating condition in accordance with the governing specification.

1.3.2 Mating stability

Plug motion relative to receptacle before and after exposure, but not during the exposure.

1.3.3 Coupling ring stability

Coupling ring motion relative to receptacle before and after exposure but not during the exposure.

1.4 Description

The item to be evaluated will be examined according to the procedure(s) selected to check for full connector mating condition. These are nondestructive procedures and as such, have limitations of the extent to which the item under test can be inspected. Some connectors are designed to have "metal-to-metal" bottoming as a criteria of the full mating conditions, whether or not an interfacial seal is present. Other connectors are designed with interfacial seals which by design preclude metal-to-metal bottoming. The following selection of methods is intended to allow choice of the one most appropriate technique for the particular connector being evaluated. Documentation is required to complete the testing of a connector pair, following the required information requested in clause 6.

1.4.1 Test method A, test measurement for mating stability

A fully mated connector plug and receptacle pair shall be marked with indicator lines such that an accurate ± 0.02 millimeters (0.001 inch) axial measurement can be made. This should be done on at least 2 opposite sides of the connector.

1.4.2 Test method B, test measurement for coupling ring stability

A fully mated connector plug and receptacle pair shall be marked with radial marks on both the coupling ring and the receptacle. These marks will allow observation of coupling ring rotation relative to the receptacle. In addition, axial marks shall be applied to both coupling ring and receptacle shell to allow observation of translation of the coupling ring relative to the receptacle shell. Measurements are made before and after the appropriate mechanical or environmental tests.

1.4.3 Test method C, metal-to-metal bottoming

There are at least two methods which will enable determining whether or not a condition of metal-to-metal bottoming of shells is achieved. Use one of the methods and indicate which one was used in the documentation of the test; see clause 6. Method C should be performed in conjunction with methods A or B when assessing environmental effects.

1.4.3.1 Test method C-1, transfer indicator

Using a transfer compound (such as a bluing compound) as an indicator on one of the connector mating surfaces, check the opposing mating surface following a fully mating test. This opposing mating surface should indicate evidence of marking transfer. Transfer of marking material shall be the indication of achieving metal to metal bottoming.

1.4.3.2 Test method C-2, deformation indicator

Using a thin deformable material (such as Plastigauge™) between the connector mating surfaces, check the thickness of the deformable material following a fully mating test. Deformation of the thin deformable material to 0.02 millimeters (0.001 inch) thickness or less shall be the indication of achieving metal to metal bottoming.

2 Test resources

2.1 Equipment

2.1.1 Test method A, test measurement for mating stability

Fixtures to hold the connector receptacle in its intended mounting configuration shall be provided. A suitable marker may be used to place indicator marks on the plug shell and receptacle shell. Magnification equipment may be used to allow accurate measurement ± 0.02 millimeters (0.001 inch) of the relative mark or feature locations.

2.1.2 Test method B, test measurement for coupling ring stability

Fixtures to hold the connector receptacle in its intended mounting configuration shall be provided. A suitable marker may be used to place indicator marks on the coupling ring and receptacle shell. Magnification equipment may be used to allow accurate measurement ± 0.02 millimeters (0.001 inch) of the relative mark or feature locations.

2.1.3 Test method C, metal-to-metal bottoming

Fixtures to hold the connector receptacle in its intended mounting configuration shall be provided. A transfer compound shall be used to mark the appropriate surface in accordance with method C-1 if that method is used. A thin, deformable material suitable for the purpose of indicating pressure application between 2 mating surfaces shall be used in accordance with method C-2 if that method is used. Suitable magnification equipment to examine the indicators shall be available for post-test measurement / evaluation.

3 Test specimen

3.1 Description

The test specimen shall consist of a mated pair of connector assemblies including multiple contacts, the exterior of the connector receptacle being marked appropriately to allow observation of relative change between connector plug and receptacle shells during exposure to environmental or mechanical influence. This may be a standard marking which is placed on the connector shell as a normal indication of full connector mating engagement or a mark added to the exterior of the appropriate connector shell.

3.2 Preparation

3.2.1 Test method A, test measurement for mating stability

The connector pair shall be coupled to the fully mated condition by appropriate means for that connector coupling design, such as hand-tightening for bayonet coupling mechanisms or tightening to achieve a visual indication. Features may be selected as observation indicators or a mark may be applied to the plug and receptacle shell coplanar to the central axis of the connector. Marks or features shall be on both sides of the mated pair about 180° apart to make two sets of measurements. The axial distance between indicator features should be recorded prior to exposure to test conditions to the nearest 0.02 millimeters (0.001 inch). Results shall be averaged from both sides.

3.2.2 Test method B, test measurement for coupling ring stability

3.2.2.1 The connector pair shall be coupled to the fully mated condition by appropriate means for that connector coupling design, such as hand-tightening for bayonet coupling mechanisms or torque wrench tightening to specified values for threaded coupling mechanisms. Radial marks shall be applied to both coupling ring and receptacle shell. Relative location of (distance between) the radial marks shall be recorded prior to exposure to test conditions.

3.2.2.2 Axial marks shall be applied to both plug coupling ring and to the receptacle shell. relative location of (distance between) the axial marks should be recorded prior to exposure to test conditions.

3.2.3 Test method C, metal-to-metal bottoming

3.2.3.1 Test method C-1 transfer compound

Apply transfer compound (such as bluing compound) to one surface, either the plug or the receptacle, on the surface expected to complete metal-to-metal bottoming. Application should be in accordance with the transfer compound manufacturer’s recommendations, i.e. less than 0.05mm (.002 inch) thick.. The connector pair shall be coupled to the fully mated condition by appropriate means for that connector coupling design, such as hand-tightening for bayonet coupling mechanisms or tightening to achieve a visual indication. Care shall be taken not to overtighten the connector pair. The connector pair shall be uncoupled for examination of the mating surfaces. The mating surface opposing the surface to which marking transfer compound was applied shall be examined. This opposing surface should indicate evidence of marking transfer if metal to metal bottoming has occurred.

3.2.3.2 Test method C- 2 deformation indicator

The thickness of thin deformable indicator material shall be measured. Prior to coupling of the connector pair, this material shall be positioned between the connector mating surfaces. The connector pair shall be coupled to the fully mated condition by appropriate means for that connector coupling design, such as hand-tightening for bayonet coupling mechanisms or tightening to achieve a visual indication. Care shall be taken not to overtighten the connector pair. The connector pair shall be uncoupled for examination of the mating surfaces. The thin deformable material shall be removed and the thickness measured either directly or indirectly (a change in width can be used to estimate the change in thickness). Deformation of the thin deformable material 0.02 millimeters (0.001 inch) thickness or less shall be indication of achieving metal to metal bottoming.

4 Test procedure

4.1 Test method A, measurement for mating stability

4.1.1 Exposure to test environment

The connector pair under test shall be exposed to the desired environmental and/or mechanical test(s).

4.1.2 Post-test examination

The connector pair, after having been exposed to the test conditions, shall be examined for relative alignment of the indicator features. The relative location of (distance between) the alignment features shall be recorded and compared to the initial (pre-test) relative location of the same features.

4.2 Test method B, measurement for coupling ring stability

4.2.1 Exposure to test environment

The connector pair under test shall be exposed to the desired environmental and/or mechanical test(s).

4.2.2 Post-test examination

The connector pair, after having been exposed to the test conditions, shall be examined for relative location of the indicator features. The relative location of (distance between) the radial and axial indicator features shall be recorded and compared to the initial (pre-test) relative location of the same features.

4.3 Test method C-1, metal-to-metal bottoming

4.3.1 Perform 3.2.3.1.

4.3.2 Subject specimens prepared in 3.2.1 or 3.2.2 to the procedure specified in 4.1 or 4.2.

4.3.3 Clean specimens.

4.3.2 Repeat 3.2.3.1.

4.4 Test method C-2, metal to metal bottoming

4.4.1 Perform 3.2.3.2

4.4.2 Subject specimens prepared in 3.2.1 or 3.2.2 to the procedure specified in 4.1 or 4.2.

4.4.3 Clean specimens.

4.4.4 Repeat 3.2.3.2.

5 Details to be specified

The following details shall be specified in the referencing document:

5.1 Test method to be used: A, B, C-1, C-2.

5.2 Description of connector specimen to be used.

5.3 Connector initial condition to be achieved prior to the test.

5.4 Induced test to be conducted on the connector specimen.

5.5 Post-test measurements to be taken following the induced test.

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 the type and overall physical construction of the connector specimen tested. This includes any special markings added to the specimen for purposes of evaluation under the guidelines of this test procedure.

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

6.4 Description of test fixture

6.5 Initial condition description of the connector under test

6.6 Final condition description of the connector under test

6.7 Name of operator and date of test

EIA Document Improvement Proposal

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