



EIA STANDARD

TP-91A

DUST TEST PROCEDURE FOR ELECTRICAL CONNECTORS AND SOCKETS

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(Revision of EIA-364-91)

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Electronic Components, Assemblies & Materials Association

ELECTRONIC COMPONENTS, ASSEMBLIES & MATERIALS
ASSOCIATION

THE ELECTRONIC COMPONENTS SECTOR OF THE ELECTRONIC INDUSTRIES ALLIANCE



EIA/ECA-364-91A

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(From Standards Proposal No. 5063 formulated under the cognizance of the CE-2.0 National Connectors Standards Committee.

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TEST PROCEDURE No. 91A
DUST TEST PROCEDURE
FOR
ELECTRICAL CONNECTORS AND SOCKETS

(From EIA Standards Proposal No. 5060, formulated under the cognizance EIA CE-2.0 Committee on National Connector Standards, and previously published in EIA-364-91.)

1 Introduction

1.1 Scope

1.1.1 This standard establishes a test method to determine the susceptibility of an electrical connector or socket system to the potential degradation mechanism of a dust/fiber environment common to an office or manufacturing area.

1.1.2 This method may be used as a preconditioning test whereby the test specimen is exposed to a heavy concentration of dust and then exposed to a subsequent environment or as a “stand alone” test.

1.1.3 This test should not be considered as an alternate or replacement for the EIA-364-50 (Sand and Dust Test Procedure for Electrical Connectors and Sockets) that simulates an outdoor desert type environment.

CAUTION—This procedure may involve hazardous materials, operations and equipment. This procedure does not purport to address all safety problems associated with its use or all regulatory requirements. It is the responsibility of the user of this procedure to establish appropriate safety and health practices and to determine the applicability of regulatory limitations before its use.

2 Test resources

2.1 Equipment

2.1.1 A dust chamber of sufficient size to allow the test specimens to be placed in the chamber with the clearances as indicated in 4.1.

2.1.2 An air blower system of sufficient size to maintain a flow rate of 300 meters/minute (1000feet/minute) \pm 20%, unless otherwise specified in the referencing document.

2.1.3 A dust dispensing system capable of holding the volume of dust required.

2.1.4 A timing circuit may be required for those situations where dust is to be applied in a time cycle mode.

2.1.5 Unless otherwise specified, the air blower/dust dispensing system shall be capable of blowing the dust in a vertically upward direction from the bottom of the chamber to the top of the chamber.

2.1.6 The chamber attitude shall be such that when the blower is in an off condition, the dust shall fall by gravity to the bottom of the chamber into a collection area.

2.2 Material

2.2.1 Dust composition

Unless otherwise specified in the referencing document, the specified dust composition shall be one of those listed in table A.1 or A.2. The dust composition shall not be reused in any subsequent test.

3 Test specimen

3.1 Description

The referencing document shall specify if the test specimens are to be exposed mated or unmated. If unmated, it shall be specified if the receptacle, mating device or both is to be exposed.

If _____ not specified, only the connector normally exposed to the environment shall be tested unmated.

3.2 Preparation

The test specimens shall be placed in the chamber in such a manner as not to be closer than 76 mm (3.0 inch) from the walls of the test chamber and not closer than 76 mm (3.0 inches) from the dust entry area.

3.2.1 The specimens shall be held in place using non-reactive materials in a manner allowing unobstructed air flow around said specimens.

3.2.2 If multiple specimens are to be exposed simultaneously, the specimens shall be placed so as not to be closer than 50 mm (2.0 inches) from each other. Multiple specimens shall be spaced side by side in a manner that does not prevent dust accumulation on or in the specimens.

3.2.3 The test specimens shall be exposed in their normal terminated state.

3.2.4 The test specimens shall be placed in the chamber in the orientation representing their application and shall be specified in the referencing document.

3.2.5 Prior to exposure, the dust composition to be used shall be placed in a tray or holding container and evenly spread. The dust shall then be placed in an oven and dried at $50\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ for 1.0 hour minimum.

3.2.6 Prior to exposure, the specimens to be tested shall not be cleaned unless the cleaning process is an actual part of the product application process of instructions.

4 Test procedure

4.1 The specimens shall be placed in the chamber in accordance with clause 3, unless otherwise specified in the referencing document.

4.2 The mass of dust shall be 9 grams \pm 1 gram per cubic foot of chamber volume, unless otherwise specified in the referencing document.

4.3 After specimen placement, the air blower system shall be turned on.

4.4 The exposure duration shall be 1.0 hour +5.0 minutes / -0.0 minutes, unless otherwise specified in the referencing document.

4.5 Upon completion of the exposure, the air blower system shall be turned off. The specimens shall not be removed from the chamber for a minimum of 1.0 hour.

4.6 Upon removal from the chamber, the specimens shall not be cleaned, wiped or have air blown on them. Specimens may be tapped at rate of 25.4 millimeters/second (1.0 inch/second) on a flat surface typical of a laboratory bench, 5 times for removal by gravity of excess accumulation.

4.7 After completion of each exposure, the interior of the chamber and dust delivery system shall be cleaned as much as practical. Brushing and vacuuming shall be sufficient.

4.8 Subsequent attribute monitoring or exposure to other environments shall, be in accordance with the referencing document.

4.9 This test shall be performed in a chamber at room ambient conditions as follows:

- Temperature: $25\text{ }^{\circ}\text{C} \pm 7\text{ }^{\circ}\text{C}$
- Relative humidity: $<70\%$

5 Details to be specified

The following details shall be specified in the referencing document:

5.1 Dust composition #1 or #2, see table 1 or 2

5.2 Volume of dust

5.3 Subsequent tests

5.4 Pass/fail criteria

5.5 Mated or unmated

6 Documentation

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

6.1 Title of test

6.2 Specimen description including orientation, mating and termination conditions

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

6.4 Test condition

6.4.1 Dust composition

6.4.2 Mass of dust

6.4.3 Duration

6.5 Visual observations and results

6.6 Name of operator and date of test

Annex

A Dust composition (normative)

The dust compositions contained herein are classified as benign or corrosive.

A.1 Benign composition

The benign composition should be considered for office environment applications in non-industrial areas or in filtered areas located in industrial areas.

Table A.1 – Dust composition #1 (Benign)

Particulate	Weight %	Size (see notes)	Chemical nomenclature
Silica	36	2 - 7	SiO ₂
Calcite	29	2 – 7	CaCO ₃
Iron oxide	12	2 – 4	Fe ₂ O ₃
Alumina	8	2 – 5	Al ₂ O ₃
Gypsum	5	2 – 7	CaSO ₄
Paper fibers	3	3 –150 (diameter 12)	
Cotton fibers	1	10-1500 (diameter 13)	
	1	2540 nom. (diameter 13)	
	1	6350 nom. (diameter 13)	
Polyester fibers	1	7-1500 nom. (diameter 22)	
	1	2540 nom. (diameter 22)	
	1	6350 nom. (diameter 22)	
Carbon black	1.0	0.01-0.02	
NOTES			
1 All sizes are in micrometers			
2 Paper, cotton and polyester fibers relate to length. All other elements are diameters.			

A.2 Corrosive composition

The corrosive composition should be considered for corrosive industrial applications both in sheltered and unsheltered atmospheres.

Table A.2 – Dust composition #2 (Corrosive)

Particulate	Weight %	Chemical Nomenclature
Potassium nitrate	1.640	KNO ₃
Potassium chloride	2.250	KCl
Ammonium chloride	4.050	NH ₄ Cl
Ammonium nitrate	6.050	NH ₄ NO ₃
Magnesium nitrate hexahydrate	2.400	Mg(NO ₃) ₂ •6H ₂ O
Magnesium sulfate heptahydrate	34.600	MgSO ₄ •7H ₂ O
Feldspar	18.800	CaO•Al ₂ O ₃ •2SiO ₂
Calcium sulfate	3.080	CaSO ₄
Titanium dioxide	0.299	TiO ₂
Manganese dioxide	0.091	MnO ₂
Ferric oxide	8.550	Fe ₂ O ₃
Cupric oxide	1.420	CuO
Zinc oxide	1.130	ZnO
Paper fibers	15.68	-----
NOTE — The size of the dust particle shall be of such a size as to pass through a mesh size of 325.		

EIA Document Improvement Proposal

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