



ANSI/EIA/ECA-364-10D
Approved: March 2, 2006

EIA STANDARD

TP-10D

**FLUID IMMERSION TEST PROCEDURE FOR
ELECTRICAL CONNECTORS**

EIA/ECA-364-10D

(Revision of EIA-364-10C)

MARCH 2006



Electronic Components, Assemblies & Materials Association

**ELECTRONIC COMPONENTS, ASSEMBLIES & MATERIALS
ASSOCIATION**

THE ELECTRONIC COMPONENTS SECTOR OF THE ELECTRONIC INDUSTRIES ALLIANCE



EIA/ECA-364-10-D

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(From Standards Proposal No. 5103 formulated under the cognizance of the CE-2.0 National Connectors Standards Committee.

Published by

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Technology Strategy & Standards Department
2500 Wilson Boulevard
Arlington, VA 22201

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TEST PROCEDURE No. 10 D

FLUID IMMERSION TEST PROCEDURE FOR ELECTRICAL CONNECTORS

(From EIA Standards Proposal No. 5103, formulated under the cognizance EIA CE-2.0 Committee on National Connector Standards, and previously published in EIA-364-10C.)

1 Introduction

1.1 Scope

This standard establishes test methods to determine the ability of an electrical connector or connector assembly to resist degradation due to exposure to specific fluids with which the connector assembly may come into contact during its service life.

CAUTION —

- 1 This standard may involve hazardous materials, operations and equipment. This standard does not purport to address all the safety problems that are 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 before its use.
- 2 All aspects of handling, use and disposal of spent hazardous materials shall be in accordance with all applicable Federal, State and Local laws and regulations, including OSHA and environmental regulations, licenses or permits.

2 Test resources

2.1 Equipment

2.1.1 Pyrex beakers (one for each test fluid) or similar stainless vessels to contain the various fluids in a sufficient quantity to completely immerse mated connectors, including wire if appropriate.

2.1.2 Air-circulating oven capable of maintaining temperature within ± 3 °C of required setting. The maximum test temperature is 175 °C.

2.1.3 Suitable temperature-measuring device for the liquid(s) used in the test.

2.1.4 Hot plates or equivalent.

2.1.5 Exhaust hoods.

2.2 Material

The fluids listed in table 1 represent those in wide general use. When other special fluids or exceptions to table 1 are required for a particular connector, they shall be indicated in the referencing document. The test temperature shall be at least 10 °C below the fluid flash point.

3 Test specimen

3.1 Description

A mateable connector or connector assembly is required for each fluid tested.

3.2 Preparation

3.2.1 If required, the connector shall be wired as specified. The wire shall be the minimum size outside diameter for which the connector was designed, and the wire length shall be sufficient to enable the connector to be immersed without the wire ends becoming contaminated with fluid. Tetrafluoroethylene (TFE) insulated wire is recommended because it is fluid-resistant and capable of withstanding the test temperatures. When sealing plugs are supplied for use in unwired contact cavities, they should be installed in place of wire in approximately 10 percent of contact cavities.

3.2.2 The connectors are required to be maintained in a mated or unmated condition for test as specified. The coupling and locking mechanism that is an integral part of the connector design, shall be used if tested in a mated condition. If connectors do not have a coupling and locking mechanism, a suitable method of clamping them together shall be detailed by the testing agency. The fixture with the connector shall be capable of fitting within the fluid container, and both the fixture and the connector shall be capable of withstanding the fluids and test temperature.

3.2.3 The connectors shall be identified both as to mating assemblies and with the fluid in which they are to be immersed. All wires on each plug and receptacle shall be identified with the corresponding contact designation. All identification marks shall be durable enough to complete the test without loss of clarity.

4 Test procedure

The test procedure detailed below shall be followed in sequence. A specimen shall be exposed to only one fluid, unless otherwise specified in the referencing document. Testing shall be performed at standard atmospheric conditions unless otherwise specified. Conduct all exposures in a fume hood.

4.1 The initial torques or forces required to mate and unmate each connector or connector assembly shall be measured and recorded, if the referencing document test schedule includes mating and unmating measurements before the immersion test; see EIA-364-13

4.2 Preheat each test fluid until it has stabilized at the temperature specified; see table 1 or the referencing document

4.3 The test cycle shall be as specified for each test fluid; see table 1 or the referencing document.

4.4 Transition time between steady state conditions shall be two minutes maximum and steady state conditions shall be maintained at the specified time with a tolerance of + one minute unless otherwise specified in the referencing document.

4.5 Fluid shall be drained from all recesses by gravity.

4.6 Connectors shall be placed in an air-circulating oven for the time specified in table 1. Repeat number of cycles specified.

4.7 Remove the specimens and allow them to stabilize at room temperature for a minimum of 1 hour.

4.8 The final torques or forces required to mate and unmate each connector or connector assembly shall be measured and recorded, if the referencing document test schedule includes mating and unmating measurements after the immersion test; see EIA-364-13.

4.9 Connectors shall be visually examined with the unaided eye for evidence of degradation. Examples of visible degradation from this test may be:

4.9.1 Swelling, cracking or pitting of any resilient material.

4.9.2 Loss of seal or adhesive bonding between two bonded surfaces.

4.9.3 Discoloration of materials, finishes and marking, but this may not be considered detrimental.

4.9.4 Softening of any materials.

4.9.5 Reduction of electrical properties.

5 Details to be specified

The following details shall be specified in the referencing document:

5.1 Number of specimens tested for each fluid

5.2 Whether connector is immersed mated or unmated

5.3 Test condition (fluids to be used); see table 1

5.4 Other fluids, not listed in table 1, shall be specified along with their test conditions

5.4 Type of wire insulation if other than TFE

5.5 Test cycle duration and temperature of fluid, if other than as specified in table 1

5.6 Torque or force measurements to mate and unmate, if applicable

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 and identification, including fixture if applicable

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

6.4 Test fluids used

6.5 Test condition number or test cycle duration and temperature of fluid if other than specified in table 1.

6.6 Visual observations, measurements and results arranged in a "before" and "after" style preferably using one sheet for each connector assembly.

6.7 Name of operator and date of test

Table 1 - Test fluids

Test condition	Fluid	Preconditioning		Test cycles					Number of cycles
				Immersion		Drainage time	Oven cure, mated		
		Time minutes	Temp, °C	Time minutes	Temp, ±3 °C	Free air, hours	Time hours	Temp, ±3 °C	
A	Hydraulic fluid, per MIL-H-5606			5	85	1	6	100	7
B	Turbine fluid, grade JP-8, per MIL-DTL-83133 (NATO Type 34)			5	25	1	6	55	7
C	Lubricating oil, per MIL-L-7808			5	120	1	6	125	7
D	Lubricating oil, per MIL-PRF-23699			5	120	1	6	125	7
E (see note 1)	Defrosting fluid, per MIL-A-8243			5	65	1	6	100	7
F (see note 1)	Cleaning compound, diluted for cleaning, per MIL-PRF-87937 type I alkaline base			5	65	1	6	100	7
G	Gasoline, per ASTM-D-4814			5	25	24			5
H	Gasohol, per A-A-52530			5	25	24			5
I	One part isopropyl alcohol, per TT-I-735, grade A or B; and 3			5	25	24			5

	parts mineral spirits, per A-A-2904, type II, grade A or P-D-680, type I, by volume								
J	Deleted								
K	Coolant, dielectric fluid, synthetic silicate ester base MIL-PRF-47220 (Coolanol 25) or equivalent	30	175	1.0 ± 0.1	Room ambient (see note 2)	1			1
L	Deleted								
Z	As specified in the referencing document								
NOTES									
1 Shall be mated during immersion, unless otherwise specified in the referencing document.									
2 Temperature, 15 °C to 35 °C; atmospheric pressure, 650 millimeters of mercury to 800 millimeters of mercury; relative humidity, 20% to 80%.									

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