

The documentation and process conversion measures necessary to comply with this revision shall be completed by 8 July 2002.

INCH-POUND

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8 February 2002
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1 APRIL 1980

DEPARTMENT OF DEFENSE
TEST METHOD STANDARD
ELECTRONIC AND ELECTRICAL COMPONENT PARTS



AMSC N/A
DISTRIBUTION STATEMENT A.

Approved for public release; distribution is unlimited.

FSC 59GP

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FOREWORD

1. This military standard is approved for use by all Departments and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center Columbus, P.O.Box 3990, Columbus, OH 43216-5000, by using the self-addressed Standardization Document Improvement Proposal (DDForm 1426) appearing at the end of this document or by letter.

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1. SCOPE

1.1 Purpose. This standard establishes uniform methods for testing electronic and electrical component parts, including basic environmental tests to determine resistance to deleterious effects of natural elements and conditions surrounding military operations, and physical and electrical tests. For the purpose of this standard, the term "component parts" includes such items as capacitors, resistors, switches, relays, transformers, inductors, and others. This standard is intended to apply only to small component parts, weighing up to 300 pounds or having a root mean square test voltage up to 50,000 volts unless otherwise specifically invoked. The test methods described herein have been prepared to serve several purposes:

- a. To specify suitable conditions obtainable in the laboratory that give test results equivalent to the actual service conditions existing in the field, and to obtain reproducibility of the results of tests. The tests described herein are not to be interpreted as an exact and conclusive representation of actual service operation in any one geographic location, since the only true test for operation in a specific location is an actual service test at that point.
- b. To describe in one standard (1) all of the test methods of a similar character which appeared in the various joint or single-service electronic and electrical component parts specifications, (2) those test methods which are feasible for use in several specifications, and (3), the recognized extreme environments, particularly temperatures, barometric pressures, etc., at which component parts will be tested under some of the presently standardized testing procedures. By so consolidating, these methods may be kept uniform and thus result in conservation of equipment, man-hours, and testing facilities. In achieving these objectives, it is necessary to make each of the general tests adaptable to a broad range of electronic and electrical component parts.
- c. The test methods described herein for environmental, physical, and electrical tests shall also apply, when applicable, to parts not covered by an approved military specification, military sheet form standard, specification sheet, or drawing.

1.2 Test method numbering system. The test methods are designated by numbers assigned in accordance with the following system:

1.2.1 Class of tests. The tests are divided into three classes: Test methods numbered 101 to 199 inclusive, cover environmental tests; those numbered 201 to 299 inclusive, cover physical characteristics tests; and those numbered 301 to 399 inclusive, cover electrical characteristics tests. Within each class, test methods are serially numbered in the order in which they are introduced into this standard.

1.2.2 Revision of test methods. Revisions of test methods are indicated by a letter following the method number. For example, the original number assigned to the moisture resistance test method is 106; the first revision of that method is 106A, the second revision, 106B, etc.

1.3 Method of reference. When applicable, test methods contained herein shall be referenced in the individual specification by specifying this standard, the method number, and the details required in the summary paragraph of the referenced method. To avoid the necessity for changing specifications which refer to this standard, the revision letter following the method number shall not be used when referencing test methods. For example, use "Method 106", not "Method 106A".

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, 5, and individual test methods of this standard. This section does not include documents cited in other sections of this standard or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3, 4, 5, and the individual test methods, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

DEPARTMENT OF DEFENSE

- MIL-PRF-680 - Degreasing Solvent
- MIL-S-901 - Shock Tests, HI (High Impact), Shipboard Machinery, Equipment and Systems, Requirements For
- MIL-DTL-1222 - Studs, Bolts, Hex Cap Screws, Socket Head Cap Screws and Nuts
- MIL-I-24768/14 - Insulation, Plastic, Laminated, Thermosetting, Cotton-Fabric-Base, Phenolic-Resin (FBG)

FEDERAL

- QQ-B-654 - Brazing Alloys, Silver
- QQ-S-698 - Steel, Sheet and Strip, Low Carbon
- TT-I-735 - Isopropyl Alcohol

2.2.2 Other government documents, drawings, and publications. The following other government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

CODE OF FEDERAL REGULATIONS (CFR)

- 10 CFR 20 - Standards For Protection Against Radiation
- 10 CFR 30 - Rules of General Applicability to Domestic Licensing of Byproduct Material
- 10 CFR 31 - General Domestic Licenses For Byproduct Material
- 10 CFR 32 - Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material

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2.3 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the document(s) that are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

ACOUSTICAL SOCIETY OF AMERICA

ASA 2.2-1959 - Methods for the Calibration of Shock and Vibration Pickups

(Application for copies should be addressed to Acoustical Society of America, 120 Wall Street, 32nd Floor, New York, NY 10005-3993.)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/NCCL Z540-1 - Calibration Laboratories and Measuring and Test Equipment, General Requirements

ANSI/J-STD-002 - Solderability Tests For Component Leads, Terminations, Lugs, Terminals and Wires

ANSI/J-STD-004 - Requirements For Soldering Fluxes

ANSI/J-STD-005 - Requirements For Soldering Pastes

ANSI/J-STD-006 - Requirements For Electronic Grade Solder Alloys and Fluxed and Non-Fluxed Solid Solders For Electronic Soldering Applications

(Application for copies should be addressed to the American National Standards Institute, Incorporated, 1430 Broadway, New York, NY 10018.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM A-519-96 - Standard Specification For Seamless Carbon and Alloy Steel Mechanical Tubing

(Application for copies should be addressed to the American National Standards Institute, Incorporated, 1430 Broadway, New York, NY 10018.)

INSTITUTE FOR INTERCONNECTING AND PACKAGING ELECTRONIC CIRCUITS

IPC-4101 - Specification For Base Materials For Rigid and Multilayer Printed Boards

(Application for copies should be addressed to the Institute for Interconnecting and Packaging Electronic Circuits, 2215 Sanders Road, Northbrook, IL 60062-6131.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. DEFINITIONS

This section is not applicable to this standard.

4. GENERAL REQUIREMENTS

4.1 Test requirements. The requirements which must be met by the component parts subjected to the test methods described herein are specified in the individual specifications. Whenever this standard conflicts with the individual specification, the latter shall govern.

4.2 Test conditions. Unless otherwise specified herein, or in the individual specification, all measurements and tests shall be made at temperatures of 15°C to 35°C (59°F to 95°F) and at ambient air pressure and relative humidity. Whenever these conditions must be closely controlled in order to obtain reproducible results, for referee purposes, a temperature of 25°C, +0°C, -2°C (77°F, +0°F, -3.6°F), relative humidity of 50 ±2 percent, and atmospheric pressure of 650 to 800 millimeters of mercury shall be specified.

4.2.1 Permissible temperature variation in environmental chambers. When chambers are used, specimens under test shall be located only within the working area defined as follows:

- a. Temperature variation within working area: The controls for the chamber shall be capable of maintaining the temperature of any single reference point within the working area within ±2°C (3.6°F).
- b. Space variation within working area: Chambers shall be so constructed that, at any given time, the temperature of any point within the working area shall not deviate more than 3°C (5.4°F) from the reference point except for the immediate vicinity of specimens generating heat.

4.3 Reference conditions. Reference conditions as a base for calculations shall be 25°C (77°F) for temperature, or an alternate temperature of 20°C (68°F), 760 millimeters of mercury for air pressure, and a relative humidity of 50 percent.

4.4 Calibration requirements. Calibration shall be applied to those items of measuring and test equipment used to assure product compliance with specifications and contractual requirements. Calibration shall be performed in accordance with the requirements of ANSI/NCSS Z540-1 or equivalent. Calibrated items shall be controlled, used, and stored in a manner suitable to protect calibration integrity. Test equipment requiring calibration shall be identified and labeled in accordance with ANSI/NCSS Z540-1 or equivalent.

5. DETAILED REQUIREMENTS

This section is not applicable to this standard.

6. NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory).

6.1 Intended use. This test method standard specifies uniform procedures for the environmental, physical, and electrical testing of electronic and electrical component piece parts. It is intended as a reference document for test requirements called out in military component specifications and when specified, in other procurement specifications and drawings.

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6.2 Sequence of tests. The sequence of tests that follow is provided for guidance to specification writers to emphasize the philosophy that parts be mechanically and thermally stressed prior to being subjected to a moisture resistance test. Within any of the three groups and subgroups, the order is preferred but not mandatory. It is recommended that this sequence be followed in all new specifications and when feasible, in revisions of existing specifications. In the case of hermetically sealed parts, when a moisture resistance test is not required, a high sensitivity seal test may be used in lieu of the moisture resistance test.

<u>Group I</u> (all samples) Visual inspection Mechanical inspection Electrical measurements Hermetic seal test (if applicable)	<u>Group IIa</u> (part of a sample) Shock Acceleration Vibration	<u>Group IIb</u> (part of a sample) Resistance to soldering heat Terminal Strength Thermal Shock
<u>Group III</u> (all units which have passed group II tests) Moisture resistance or seal test on hermetically sealed parts		

6.3 Chemical listing. The following is a list of chemicals and their chemical abstracts service (CAS) registry number identified for use in MIL-STD-202 test methods:

<u>Material</u>	<u>CAS number</u>	<u>Test method</u>
ethylbenzene	100-41-4	215
fluorocarbon/perfluorocarbon	-----	107, 112, 210
helium	7440-59-7	112
hydrochloric acid	47-01-0	101
isopropyl alcohol	67-63-0	215
kerosene	8008-20-6	215
krypton-85	13983-27-2	112
mineral oil	8012-95-1	112
mineral spirits	8052-41-3	215
monoethanolamine	141-43-5	215
n-hexane	110-54-3	109
peanut oil	8002-03-7	112
propane	74-98-6	111
propylene glycol monomethylether	107-98-2	215
silicone oil	63148-58-3	112
sodium chloride	7647-14-5	104
sodium hydroxide	1310-73-2	101
terpene	-----	215

6.4 Subject term (key word) listing.

Acceleration
Barometric pressure
Capacitance
Contact chatter/resistance
Current noise
Current switching
DC resistance
Dielectric withstanding voltage
Explosion
Flammability
Humidity
Immersion
Insulation resistance
Life
Moisture resistance
PIND
Quality factor
Radiographic inspection
Random drop
Resistance-temperature characteristic
Resistance to soldering heat
Resistance to solvents
Salt atmosphere
Sand and dust
Shock
Solderability
Terminal strength
Thermal shock
Vibration
Voltage coefficient

6.5 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:

Army - CR
Navy - EC
Air Force - 11

Preparing activity:
DLA – CC

(Project 59GP-0170)

Review activities:

Army - AR, AT, AV, CR4, MI, SM, TE
Navy - AS, OS, SH
Air Force - 19, 99
NSA - NS

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NUMERICAL INDEX OF TEST METHODS

Test Method Number	Date	Title
Environmental tests (100 class)		
101E	8 February 2002	Salt atmosphere (corrosion) (formerly called salt spray)
102A	Cancelled	Superseded by Method 107 (see note on Method 102)
103B	12 September 1963	Humidity (steady state)
104A	24 October 1956	Immersion
105C	12 September 1963	Barometric pressure (reduced)
106G	8 February 2002	Moisture resistance
107G	28 March 1984	Thermal shock
108A	12 September 1963	Life (at elevated ambient temperature)
109C	8 February 2002	Explosion
110A	16 April 1973	Sand and dust
111A	16 April 1973	Flammability (external flame)
112E	11 October 1988	Seal
Physical characteristics tests (200 class)		
201A	24 October 1956	Vibration
202D	Cancelled	Superseded by Method 213 (see note on Method 202)
203C	8 February 2002	Random drop
204D	1 April 1980	Vibration, high frequency
205E	Cancelled	Superseded by Method 213 (see note on Method 205)
206	12 September 1963	Life (rotational)
207B	8 February 2002	High-impact shock
208H	31 January 1996	Solderability
209	18 May 1962	Radiographic inspection
210F	8 February 2002	Resistance to soldering heat
211A	14 April 1969	Terminal strength
212A	16 April 1973	Acceleration
213B	16 April 1973	Shock (specified pulse)
214A	28 March 1984	Random vibration
215K	8 February 2002	Resistance to solvents
216	Cancelled	Superseded by Method 210 (see note on Method 216)
217A	8 February 2002	Particle impact noise detection (PIND)
Electrical characteristics tests (300 class)		
301	6 February 1956	Dielectric withstanding voltage
302	6 February 1956	Insulation resistance
303	6 February 1956	DC resistance
304	24 October 1956	Resistance temperature characteristic
305	24 October 1956	Capacitance
306	24 October 1956	Quality factor (Q)
307	24 October 1956	Contact resistance
308	29 November 1961	Current-noise test for fixed resistors
309	27 May 1965	Voltage coefficient of resistance determination procedure
310	20 January 1967	Contact-chatter monitoring
311	14 April 1969	Life, low level switching
312	16 April 1973	Intermediate current switching

