

INCH-POUND

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DETAIL SPECIFICATION

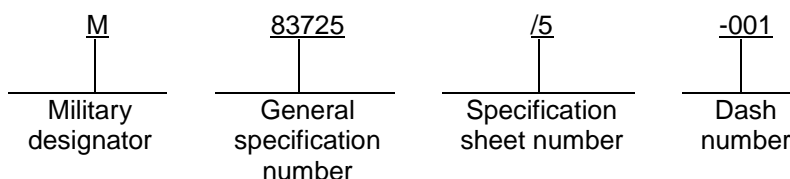
RELAYS, VACUUM, GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes the general requirements for relays with vacuum dielectric (see 6.3) for use in high or low voltage circuits of electronic and electrical equipment (see 6.1).

1.2 Part or Identifying Number (PIN). The PIN consists of the letter "M", basic specification number; specification sheet number, and an assigned dash number (see 3.1), as shown in the following example:



2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification 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 and 4 of this specification, 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 cited in the solicitation or contract.

FEDERAL

[FED-STD-H28](#) - Screw Thread Standards for Federal Services.

DEPARTMENT OF DEFENSE

STANDARDS

[MIL-STD-202](#) - Test Methods for Electronic and Electrical Component Parts.
[MIL-STD-1285](#) - Marking of Electrical and Electronic Parts.

Comments, suggestions or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAT, Post Office Box 3990, Columbus, OH 43218-3990, or emailed to relay@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.daps.dla.mil/>.

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HANDBOOKS

[MIL-HDBK-454](#) - Electronic Equipment, General Guidelines for.

(Copies of these documents are available online at <https://assist.daps.dla.mil/quicksearch> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI J-STD-004 - Requirements for Soldering Fluxes.

(Application for copies can be found online at <http://www.ansi.org/> or 25 West 43rd Street, New York, NY 10036-8002, telephone 212-642-4900, fax 212-302-1286)

2.3 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), 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. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 Qualification. The relays furnished under this specification shall be a product which has been tested, and has passed the qualification inspection specified herein, and has been listed on or approved for listing on the applicable Qualified Products List (QPL).

3.3 Materials. Materials shall be as specified herein. However, when a definite material is not specified, a material shall be used which will enable the relay to meet the performance requirements of this specification. Materials used shall be fungus inert (see 6.6), self-extinguishing; and shall not support combustion, give off noxious gases in harmful quantities, give off gases in quantities sufficient to cause explosion of sealed enclosures, cause contamination to any part of the relay, or form current carrying tracks when subjected to any of the tests specified herein. The selection of materials shall be such as to provide maximum shelf life. After qualification, any change of parts or material shall be submitted to the Government qualifying activity for approval. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

3.3.1 Metals. Metals shall be of a corrosion-resistant type or shall be plated or treated to resist corrosion. The use of mercury or mercury compounds is prohibited. The use of magnesium or magnesium alloys is prohibited (not applicable to contact systems).

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3.3.1.1 Plated finishes.

- a. Pure tin plating as an underplate or final finish, is prohibited both internally and externally. Tin content of (product) and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see [6.8](#)).
- b. Pure zinc plating is prohibited internally and externally.
- c. Pure cadmium plating is prohibited internally and externally.

3.3.1.2 Dissimilar metals. When dissimilar metals are used in intimate contact with each other, protection against electrolysis and corrosion shall be provided. The use of dissimilar metals in contact, which tends toward active electrolytic corrosion (particularly brass, copper, or steel used in contact with aluminum or aluminum alloy), is not acceptable. However, metal spraying or metal plating of dissimilar base metals to provide similar or suitable abutting surfaces is permitted. Dissimilar metals should be as defined in [6.5](#). In hermetic seals, the 0.25 volt difference between the header material and the housing material is not applicable.

3.3.2 Magnet wire. Magnet wire shall be of such quality as to ensure that the relay meets all the performance requirements of this specification.

3.3.3 Plastic. Plastic shall be of such quality as to ensure that the relay meets all the performance requirements of this specification

3.3.4 Ceramic. Ceramic shall be of such quality as to ensure that the relay meets all the performance requirements of this specification.

3.3.5 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.4 Interface and construction. Relays shall meet the interface and construction requirements specified in [3.1](#) (weight, physical dimensions, etc).

3.4.1 Enclosure. The enclosure shall be of the type and within the dimensional limits specified on the applicable specification sheet (see [3.1](#)).

3.4.2 Soldering. When soldering is employed, the use of flux shall be avoided whenever possible. If the use of flux is warranted, flux should be in accordance with ANSI J-STD-004. Soldering should be in accordance with guideline of [MIL-HDBK-454](#).

3.4.3 Weight. The weight shall be as specified (see [3.1](#)).

3.4.4 Threaded parts. All threaded parts shall be in accordance with [FED-STD-H28](#). Whenever practical, all threads shall be in conformity with the coarse-thread series. The fine-thread series shall be used only for applications that might show a definite advantage through their use. Where a special diameter-pitch combination is required, the thread shall be of American National form and of any pitch between 16 and 36 which is used in the fine-thread series.

3.4.5 Coil. The coil shall be insulated electrically from the housing and the contacts.

3.4.5.1 Coil mounting. The coil shall be mounted in such a manner that it will not loosen or become displaced during any of the tests specified herein.

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3.4.6 Contact arrangement. Relays shall have the contact arrangement specified (see 3.1). Terminals shall be as specified (see 3.1). Solder terminals shall be hot tinned dipped or solder coated. Unless otherwise specified, gold plated terminals shall not be used.

3.5 Dielectric withstanding voltage. When tested as specified in 4.5.2, the relays shall withstand the applications of the specified voltage without damage or breakdown. Any arcover (air discharge), flashover (surface discharge), or breakdown (puncture) causing excessive leakage current shall constitute failure. Unless otherwise specified (see 3.1), leakage current shall be considered excessive if greater than 30 microamperes root mean square (rms) continuous or more than (2) current surges of 100 microamperes or higher.

3.6 Insulation resistance. When relays are measured as specified in 4.5.3, the insulation resistance shall be 1,000 megohms minimum, unless otherwise specified (see 3.1).

3.7 Electrical characteristics.

3.7.1 DC resistance (coil). When relays are tested as specified in 4.5.4.1, DC resistance (coil) shall be as specified (see 3.1).

3.7.2 Contact bounce. When relays are tested as specified in 4.5.4.2, bounce time (see 6.3.5) shall be as specified (see 3.1).

3.7.3 Coil current. When relays are tested as specified in 4.5.4.3, the coil current shall be as specified (see 3.1).

3.7.4 Pickup and dropout voltage (or current). Relays shall pickup and all switching circuits shall close or open, as applicable, in the energized position when the energizing voltage (or current) is increased to a value equal to the maximum value specified, and must drop out before the energizing voltage (or current) is reduced to a value equal to the minimum value specified (see 3.1). For qualification inspection, unless otherwise specified (see 3.1), the pickup and dropout voltages (or currents) shall fall within the applicable limits when the relay is mounted in each of three mutually perpendicular planes (see 4.5.4.3 and 4.5.4.4).

3.7.5 Operate and release time. When specified (see 3.1), the relays shall be tested in accordance with 4.5.4.5. The operate and release time shall not include any contact bounce and shall be as specified (see 3.1).

3.7.6 Contact resistance. When relays are tested as specified in 4.5.4.6, the resistance of any pair of mated contacts shall not exceed the value specified (see 3.1).

3.7.7 Capacitance. When relays are tested as specified in 4.5.4.7, the capacitance shall not exceed the value specified (see 3.1).

3.8 High and low temperature operation. When relays are tested as specified in 4.5.5, the relays shall be free of mechanical defects and shall meet the requirements of dielectric withstanding voltage, insulation resistance, contact bounce, operate and release time and pickup and dropout voltage (or current) as specified in 3.5, 3.6, 3.7.2, 3.7.5, and 3.7.4 respectively.

3.9 Salt spray (corrosion). When relays are tested as specified in 4.5.6, there shall be no evidence of corrosion, no breaking, chipping, or flaking of the finish nor exposure of base metal due to corrosion which would adversely affect the application of performance characteristics of the relay.

3.10 Terminal strength. When relays are tested as specified in 4.5.7, the terminals shall not loosen nor shall there be any other damage.

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3.11 Vibration, high frequency. When tested as specified in [4.5.8](#), vibration shall not impair operation and contact chatter shall not exceed 10 microseconds. Following the vibration test, the relays shall be free of any observable damage and meet the requirements of pickup and dropout voltage (or current) as specified [3.7.4](#).

3.12 Moisture resistance. When tested as specified in [4.5.9](#), relays shall meet the requirements of dielectric withstanding voltage and insulation resistance as specified in [3.5](#) and [3.6](#), respectively.

3.13 Shock (specified pulse). When relays are tested as specified in [4.5.10](#), contact chatter shall not exceed the value specified (see [3.1](#)) and there shall be no evidence of loosening of parts.

3.14 Seal. When relays are tested as specified in [4.5.11](#), they shall meet the requirements of [3.5](#).

3.15 Life (mechanical cycling). When tested as specified in [4.5.12](#), relays shall not exhibit any failure to operate 1/ or any failure to release 2/. The contact resistance shall not exceed twice the value specified (see [3.1](#)) during any contact resistance check and the contact bounce shall not exceed twice the initial limits specified (see [3.1](#)) when measured following the test. Other electrical characteristics shall be as specified (see [3.1](#)) when measured following the test.

3.16 Thermal shock. When relays are tested as specified in [4.5.13](#), there shall be no damage to the relay, loosening of terminals, or cracking or flaking of glass insulation.

3.17 Load life (carry only). When relays are tested as specified in [4.5.14](#), the temperature shall not exceed +125°C at any time with any load current (see [3.1](#)) or contact combination.

3.18 Resistance to solvents. When relays are tested as specified in [4.5.15](#), the marking shall remain legible.

3.19 Marking. Relays shall be marked in accordance with [MIL-STD-1285](#) with the following information:

- a. Military part number.
- b. Terminal identification (see [3.1](#)).
- c. Manufacturer's name, trademark, or code symbol.
- d. Date code.

3.20 Workmanship. The relays shall be fabricated in such a manner as to be uniform in quality, and shall be free from cracked or displaced parts, sharp edges, burrs, and other defects that will affect life, serviceability, and appearance.

4. VERIFICATION

4.1 Classification of inspection. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see [4.3](#)).
- b. Conformance inspection (see [4.4](#)).

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4.2 Inspection conditions. Unless specified herein, all inspections shall be made in accordance with the test conditions specified in the general requirements of [MIL-STD-202](#).

4.3 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the government (see [6.4](#)) on sample units produced with equipment and procedures normally used in production.

4.3.1 Sample size. Ten (10) relays shall be subjected to qualification inspection.

4.3.2 Inspection routine. The samples shall be subjected to the tests specified in [table I](#), in the order shown. Ten (10) sample units shall be subjected to the examination and tests of group I. The ten (10) sample units shall be divided equally into 5 groups of 2 units each.

4.3.3 Failures. Failures in excess of those allowed in [table I](#) shall be cause for refusal to grant qualification approval.

4.3.5 Verification of qualification. To retain qualification, every 12 months the manufacturer shall provide a summary of group A inspection and a certification of compliance via the Government quality assurance representative. The summary of group A inspection shall indicate the number of inspection lots that passed and the number that failed (including the number and type of failures) together with corrective action taken to correct failures. The certification of compliance shall include verification that materials, processes, and quality control have not changed. Failure to submit the group A summary and certification of compliance shall result in loss of qualification.

4.4 Conformance inspection.

4.4.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A inspection.

4.4.1.1 Inspection lot. An inspection lot, as far as practicable, shall consist of all relays of the same design and materials, produced under essentially the same conditions, and offered for inspection at one time or at a maximum of one week's production.

4.4.1.2 Group A inspection. Group A inspection shall consist of the examination and tests specified in [table II](#) in the order shown.

4.4.1.2.1 Sampling plan. Each relay offered for inspection shall be subjected to the tests in A1. Inspection lots rejected in A1 shall not be offered for reinspection. For A2, a sample of parts shall be randomly selected in accordance with [table III](#). If one or more defects are found, the lot shall be rescreened and defects removed. After screening and removal of defects, a new sample of parts shall be randomly selected in accordance with [table III](#), if one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification.

4.4.1.2.2 Rejected lots. Inspection lots rejected in A1 shall not be offered for reinspection. If an inspection lot is rejected in A2, the supplier may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Such lots shall be separate for new lots, and shall be clearly identified as reinspected lots.

4.4.1.2.3 Disposition of sample units. Sample units which have passed group A inspection shall be delivered on the contract.

1/ This includes the failure of any or all normally open contacts to close, and the failure of any or all normally closed contacts to open, within the normal cycling condition.

2/ This includes the failure of any or all normally open contacts to open, and the failure of any or all normally closed contacts to close, within the normal cycling condition.

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TABLE I. Qualification inspection.

Examination or test	Requirement paragraph	Test method paragraph	Number of sample units to be inspected	Number of defectives permitted
<u>Q1</u>				
Visual and mechanical examination	3.1, 3.3, 3.4	4.5.1	All sample units	0
Dielectric withstanding voltage	3.5	4.5.2		
Seal	3.14	4.5.11		
Insulation resistance	3.6	4.5.3		
Electrical characteristics	3.7	4.5.4		
<u>Q2</u>				
High and low temperature operation	3.8	4.5.5	2	
Salt spray (corrosion)	3.9	4.5.6		
Terminal strength	3.10	4.5.7		
Visual and mechanical examination	3.1, 3.3, 3.4, 3.19, 3.20	4.5.1		
<u>Q3</u>				
Vibration, high frequency	3.11	4.5.8	2	
Moisture resistance	3.12	4.5.9		
Electrical characteristics	3.7	4.5.4		
Visual and mechanical examination	3.1, 3.3, 3.4, 3.19, 3.20	4.5.1		
<u>Q4</u>				1
Shock (specified pulse)	3.13	4.5.10	2	
Terminal strength	3.10	4.5.7		
Thermal shock	3.16	4.5.13		
Electrical characteristics	3.7	4.5.4		
Resistance to solvents ^{1/}	3.18	4.5.15		
Visual and mechanical examination	3.1, 3.3, 3.4, 3.19, 3.20	4.5.1		
<u>Q5</u>				
Life (mechanical cycling)	3.15	4.5.12	2	
<u>Q6</u>				
Load life (carry)	3.17	4.5.14	2	

^{1/} Any four of the ten sample units may be used for the resistance to solvents test.

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TABLE II. Group A inspection.

Inspection	Requirement paragraph	Test method paragraph	Inspection requirements
<u>A1</u>			
Dielectric withstanding voltage	3.5	4.5.2	100 percent
Electrical characteristics	3.7	4.5.4	
<u>A2</u>			
Visual and mechanical examination 1/	3.1 , 3.3 , 3.4 , 3.19 , 3.20	4.5.1	See table III
Insulation resistance	3.6	4.5.3	

1/ Two sample units only for physical dimensions.

Table III. A2 inspection requirements.

Lot size	Sample size for visual and mechanical examination and insulation resistance
2 to 12	100 percent
13 to 150	13
151 to 280	20
281 to 500	29
501 to 1,200	34
1,201 to 3,200	42
3,201 to 10,000	50
10,001 to 35,000	60
35,001 to 150,000	74
150,001 to 500,000	90
500,001 and over	102

4.5 Methods of inspection.4.5.1 Visual and mechanical inspection.

4.5.1.1 External. Relays shall be examined to verify that the materials, external design and construction, physical dimensions, marking, and workmanship are in accordance with applicable requirements.

4.5.2 Dielectric withstanding voltage (see [3.5](#)). Relays shall be tested in accordance with [method 301 of MIL-STD-202](#). The following details shall apply:

- a. Test potential - As specified (see [3.1](#)).
- b. Points of application:
 - (1) Between all mated contacts in the open position.
 - (2) Between high voltage terminals and housing.
 - (3) Between coil and housing.

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4.5.3 Insulation resistance (see 3.6). Relays shall be tested in accordance with [method 302 of MIL-STD-202](#). The following details and exception shall apply:

- a. Test condition letter - B
- b. Points of application, see [4.5.2\(b\)](#).

4.5.4 Electrical characteristics (see 3.7).

4.5.4.1 DC resistance (coil) (see 3.7.1). The DC resistance (coil) shall be measured in accordance with [method 303 of MIL-STD-202](#).

4.5.4.2 Contact bounce (see 3.7.2). Contact bounce shall be observed using an oscilloscope. Since contact welding influences contact bounce, contact current shall not exceed 0.5 amperes from a source not to exceed 10 Vdc. Bounce measurements shall be made on all contacts.

4.5.4.3 Pickup voltage (or current) (see 3.7.4). Prior to measuring the pickup voltage (or current), the relay shall be energized with rated voltage (or current) for approximately 30 minutes for qualification inspection. The energizing potential shall be reduced to zero and gradually increased until the contacts operate. A suitable indicating device shall be used to determine if the contacts operate properly.

4.5.4.4 Dropout voltage (or current) (see 3.7.4). Rated operating voltage (or current) shall be applied to the coil terminals. This voltage (or current) shall be gradually reduced until the contacts return to the unenergized position. A suitable indicating device shall be used to determine if the contacts operate properly.

4.5.4.5 Operate and release time (see 3.7.5). The operate and release time shall be measured using an oscilloscope or other suitable means. The source shall be the rated coil voltage. For purposes of test, the operate and release time shall be exclusive of contact bounce. All contact pairs shall be tested.

4.5.4.6 Contact resistance (see 3.7.6). Relays shall be tested in accordance with [method 307 of MIL-STD-202](#). The following details and exception shall apply:

- a. Method of connection - Connection jigs or other suitable means.
- b. Test current - 1 ampere DC.
- c. Maximum open-circuit test voltage - 25 percent of the rated contact voltage or 6 volts, whichever is lower.
- d. Points of application.
 - (1) Between all normally closed mated contacts (coil deenergized).
 - (2) Between all normally open mated contacts, with the coil energized with rated voltage (or current). No load shall be switched by the contacts.
- e. Number of activations prior to measurement - None.
- f. Number of test activations - Three.
- g. Number of measurements per activation - One for each contact position.

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4.5.4.7 Capacitance (when specified, see 3.7.7). Relays shall be tested in accordance with [method 305 of MIL-STD-202](#). The following detail and exception shall apply:

- a. Test frequency - 1 kilohertz, unless otherwise specified (see 3.1).
- b. Points of application - As specified (see 3.1).

4.5.5 High and low temperature operation (see 3.8). High and low temperature tests shall be performed at 125°C and -65°C, respectively, after two hours exposure at each temperature. The pickup voltage and dropout voltage (or current) shall be measured as specified in 4.5.4.3 and 4.5.4.4 and shall meet the values specified (see 3.1). Following the high and low temperature test, the relay shall be tested at 25°C ±5°C for dielectric withstanding voltage, insulation resistance, pickup and dropout voltage (or current), and operate and release time as specified in 4.5.2, 4.5.3, 4.5.4.3, 4.5.4.4, and 4.5.4.5, respectively.

4.5.6 Salt spray (corrosion) (see 3.9). Relays shall be tested in accordance with [method 101 of MIL-STD-202](#). The following detail and exception shall apply:

- a. Test condition - B.
- b. Examination after test - Relays shall be examined for evidence of corrosion, peeling, chipping, blistering of the finish, and exposure of base metal due to corrosion.

4.5.7 Terminal strength (see 3.10). Terminals shall be tested in accordance with [method 211 of MIL-STD-202](#). The following details and exceptions shall apply:

- a. Test condition - A.
- b. Applied force - 5 pounds
- c. Direction of force - Also at right angles to the direction on the longitudinal axis of the terminals.
- d. Point of application - Within 1/8-inch of the tip end of the terminal.

The relays shall be examined for evidence of breakage of the terminals or damage to the insulating base.

4.5.8 Vibration (see 3.11). Relays shall be tested in accordance with [method 204 of MIL-STD-202](#). Calibration of the test table shall be accomplished by using a substitute mass having weight and dimensions equivalent to the relay to be tested. The following details and exception shall apply:

- a. Mounting: Relays shall be rigidly mounted by normal mounting means in a suitable test jig. The vibration shall be monitored on top of the test jig in the proximity of the relay support points.
- b. Frequency and amplitude - Test condition A, unless otherwise specified (see 3.1).
- c. Electrical load conditions - The relay shall be deenergized and energized (one hour each) with rated coil voltage (or current) in each of the three mutually perpendicular directions.
- d. Measurements during vibration - Chatter of the relay contacts shall be monitored in accordance with [method 310 of MIL-STD-202](#).
- e. Measurements after vibration - Not applicable.

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4.5.9 Moisture resistance (see 3.12). Relays shall be tested in accordance with [method 106 of MIL-STD-202](#). The following details and exception shall apply:

- a. Mounting: On a corrosion resistant panel by normal mounting means.
- b. Initial measurements - Insulation resistance (see [4.5.3](#)).
- c. Final measurements - Upon completion of step 6 of the final cycle, insulation resistance shall be measured as specified in [4.5.3](#). After a 24-hour drying period, relays shall be tested as specified in [4.5.2](#) and [4.5.3](#).

4.5.10 Shock (specified pulse) (see 3.13). Relays shall be tested in accordance with [method 213 of MIL-STD-202](#). The following details and exceptions shall apply:

- a. Mounting - The relay shall be mounted by normal mounting means such as flanges or threaded base. Auxiliary mounting means such as braces, pads, or potting shall not be used.
- b. Test condition letter - J, unless otherwise specified (see [3.1](#)).
- c. Basic test - Two shocks in each direction shall be applied along the three mutually perpendicular axes of the test specimen for both the energized and deenergized condition (24 shocks).
- d. Measurements during shock - Not applicable.
- e. Measurements after shock - Upon completion of the final shock, measurements shall be made of dielectric withstanding voltage as specified in [4.5.2](#), pick up voltage as specified [4.5.4.3](#) and contact resistance as specified in [4.5.4.6](#).

4.5.11 Seal (see 3.14). Relays shall be held seven days after completion of the final vacuum seal and shall then be subjected to the test specified in [4.5.2](#).

4.5.12 Life (mechanical cycling (see 3.15). Relays shall be cycled the number of cycles and at the rate specified (see [3.1](#)). "ON" and "OFF" periods shall be approximately equal. The equipment shall test for missed operations during at least 10 percent of the expected closed and open times of the contacts for each cycle respectively. The equipment shall automatically cut off when failure occurs or shall record any failures. Insulation resistance, dielectric withstanding voltage, and electrical characteristics (except DC coil resistance) shall then be measured as specified in [4.5.3](#), [4.5.2](#), and [4.5.4](#) respectively.

4.5.13 Thermal shock (see 3.16). Relays shall be tested in accordance with [method 107, test condition B, MIL-STD-202](#) for the relay temperature range specified (see [3.1](#)). After cycling, relays shall be virtually examined for breaking, cracking, chipping or flaking of the finish or loosening of the terminals and the dielectric withstanding voltage shall be measured as specified in [4.5.2](#).

4.5.14 Load life (carry only) (see 3.17). The relay shall be mounted by normal mounting means with leads connected to the coil and contact terminals. The mounting shall be maintained at a temperature no lower than 20°C. The leads to the contact terminals shall not act as a substantial heat sink or source during the load life. The temperature shall be measured at the juncture of the contact leads and the insulating material using temperature sensitive lacquer or equivalent. Each mated contact pair shall be tested with the specified load currents (see [3.1](#)) for 30 minutes minimum.

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4.5.15 Resistance to solvents (see 3.18). Relays shall be tested in accordance with [method 215 of MIL-STD-202](#). The following details shall apply:

- a. Portion to be brushed - All marking.
- b. Specimens to be tested - Two, using first solvent solution; and one specimen each, using second and third solvent solutions. A total of four specimens shall be used.
- c. Examination - Specimens shall be examined for legibility of marking.

5. PACKAGING

5.1 Packaging For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. These relays are intended for use to provide antenna switching, switching between couplers, tap changing on RF coils, switching between transmitter and receiver, pulse forming networks, and heavy duty switching in power supplies. Their principle areas of application are aircraft, missiles, spacecraft, and ground support equipment. This does not preclude the use of these relays in other military applications.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of the specification.
- b. Specification sheet part number.
- c. Packaging requirements (see 5.1).

6.3 Glossary. The definitions listed below are not a complete glossary of relay terminology, but rather are intended as definitions of the technical terms as applied within this specification.

6.3.1 Relay, vacuum. A relay especially designed to encase the contact mechanism in a low atmospheric pressure environment.

6.3.2 Operate time. The interval between the application of the step function input signal and closing of all normally closed contacts. Bounce time is not included.

6.3.3 Release time. The interval between the trailing edge of a step function input signal and closing of all normally closed contacts. Bounce time is not included.

6.3.4 Contact bounce. Internally caused intermittent and undesired opening of closed contacts, or closing of open contacts.

6.3.5 Contact bounce time. The time interval from initial actuation of a contact to the end of bounce.

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6.3.6 Chatter. Uncontrolled making and breaking of the contacts under conditions in which the contact should remain stable.

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from the DLA Land and Maritime (VQP), P.O. Box 3990, Columbus, OH 43216-5000.

6.5 Intermetallic contact. The finishing of metallic areas to be placed in intimate contact by assembly presents a special problem, since intermetallic contact of dissimilar metals results in electrolytic couples which promote corrosion through galvanic action. To provide the required corrosion protection, intermetallic couples are restricted to those permitted by MIL-STD-889.

6.6 Fungus inert materials. For further guidance on fungus, see guideline 4 of [MIL-HDBK-454](#).

6.7 PIN. This specification requires a PIN that describes codification and/or classification and appropriate references to associated documents (see [1.2](#) and [3.1](#)).

6.8 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers. For additional information on this matter, refer to ASTM-B545 (Standard Specification for Electrodeposited Coatings of Tin).

6.9 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. As of the dating of this document, the U.S. Environmental Protection Agency (EPA) is focusing efforts on reducing 31 priority chemicals. The list of chemicals and additional information is available on their website at <http://www.epa.gov/osw/hazard/wastemin/priority.htm>. Included in the EPA list of 31 priority chemicals are cadmium, lead, and mercury. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see Section 3).

6.10 Subject term (key word) listing.

Coil
Kilovolt
Latching
Operate time
Release time

6.11 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where modifications from this revision were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

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Custodians:

Air Force - 85
Army - CR
Navy - EC
DLA - CC

Preparing activity:

DLA - CC

(Project 5945-2011-021)

Review activities:

Navy - AS, OS

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.daps.dla.mil/>.