NOTE: The document identifier and heading has been changed on this page to reflect that this is a performance specification. There are no other changes to this document. the document identifier on subsequent pages has not been changes, but will be changed the next time this document is revised.

INCH-POUND

MIL-PRF-39016E
AMENDMENT 1
13 June 1995

PERFORMANCE SPECIFICATION

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY,
GENERAL SPECIFICATION FOR

This amendment forms a part of MIL-PRF-39016E, dated 18 July 1994, and is approved for use by all Departments and Agencies of the Department of Defense.

PAGE 2

2.1.1, SPECIFICATIONS, delete and substitute:

"SPECIFICATIONS

FEDERAL

QQ-N-290 - Nickel Plating (Electrodeposited).

MILITARY

MIL-G-45204 - Gold Plating, Electrodeposited."

PAGE 3 AND 4

Delete 3.4 through 3.5 inclusive and substitute:

"3.4 Materials. Materials shall be as specified herein. However, when a definite material is not specified, a material shall be used which will enable the relays to meet the performance requirements of this specification. Materials used externally shall be fungus inert, self-extinguishing, and shall not support combustion, nor give off noxious gases in harmful quantities. Materials used internally shall not give off gases in quantities sufficient to cause explosion of sealed enclosures, cause contamination of the contacts or other parts of the relay that will adversely affect life or reliability, or form current-carrying tracks when subjected to any of the tests specified herein. Cotton-filled or wood-flour-filled materials shall not be used. Ceramic used for external surfaces shall be glazed. The use of silicone (see 6.8) or silicone compounds for any purpose is prohibited. The selection of materials shall be such as to provide maximum shelf life. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

"3.4.1 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 contacts).

"3.4.1.1 Plated finishes.

a. Use of tin plating is prohibited internally and externally (see 6.6.4.1). Use of tin-lead finishes are acceptable provided that the minimum lead content is 3 percent.

b. Use of zinc plating is prohibited internally and externally.

c. Use of cadmium plating is prohibited internally and externally.

"3.4 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 6.6 through 6.6.4, inclusive In hermetic seals, the 0.25 volt difference between the header material and the housing material is not applicable

"3.4 2 Magnet wire. Magnet wire used shall enable the relay to meet the performance requirements of this specification.

"3.5 Interface and construction requirements. Relays shall meet the interface and construction requirements as specified (e.g weight, physical dimensions) (see 3.1)."

PAGE 6

3.5.7.4.2, delete and substitute

"3.5.7.4.2 Solder dip/retinning options. The manufacturer may solder dip/retin as follows.

a After the 100 percent A1 screening test but before the A2 electrical tests.

b. As a corrective action, if the lot fails the A3 solderability test Following the solder dip/retinning process of paragraph 4.7.2.2.2.2, as a minimum, insulation resistance (all terminals to case) shall be tested, and the A4 tests shall be performed, as applicable.

c. For relays that have been subjected to and passed group A inspections. Following the solder dip/retinning process, as a minimum, the insulation resistance (all terminals to case) shall be tested, and the solder coating coverage and workmanship shall be visually examined Minor scratching of the terminals due to insertion into test sockets shall not be cause for rejection."

PAGE 8

3.12.6.1, delete and substitute:

"3.12.6.1 Coil transient suppression (applicable to dc operated relays with coil transient suppression diodes) (see 4.8.8.6.1). Coils of dc operated relays shall not generate a back EMF greater than that specified (see 3.1)."

PAGE 9

3.25, delete and substitute:

"3.25 Mechanical life (see 4.8.21). After cycling, the insulation resistance and dielectric withstanding voltage shall not exceed the limits as specified (see 3.1) and the operate and release time shall not exceed 120 percent of the limits specified (see 3.1). There shall be no mechanical or electrical failure during or following cycling. Failure of the fuse connected between case and load system ground or neutral shall constitute a failure. For relays with diodes, failure of a diode shall constitute a failure. The manufacturer's test system shall have the means to ensure that the required number of test cycles have been performed."

PAGE 12

4 1 2 1, second sentence, delete and substitute. "The following list is the minimum required raw material/component parts and subassemblies for which traceability is applicable "

PAGE 13

4.1.4, delete and substitute:

"4 1.4 ESDS protection program. This requirement is applicable to all manufacturers who handle ESDS component parts and/or materials in the relay manufacturing and/or testing process. The manufacturer shall establish and maintain an ESD control program in accordance with MIL-STD-1686 and MIL-HDBK-263 Evidence of such compliance shall be verified by the qualifying activity of this specification as a prerequisite for qualification and continued qualification. As a minimum, this system must address the identification of ESDS sub-components and end items, facilities, training, design protection, handling procedures, marking, cleaning, preservation, packaging, and quality assurance. A model ESD control program is available from the qualifying activity and may be used as a guideline document. Further guidance for ESD control is available from the EOS/ESD Association and the Electronics Industry Association (EIA)."

PAGE 16

TABLE II, Q6, columns 3 and 4: Delete and substitute "See TABLE III".

PAGE 18

TABLE III, delete and substitute:

TABLE III. Requirements for qualification and extension of qualification to lower (better). failure rate levels (90 percent confidence level).

FR level symbol	Qualified FR (%/10,000 cycles)	Cumulative unit cycles in millions					
		1/ C = 0	C = 1	C = 2	C = 3	C = 4	C = 5
L	3.0	0.767	1.30	1.77	2.23	2.66	3.09
M	1.0	2.30	3.89	5.32	6.68	7.99	9.27
P	0.1	23.0	38.9	53.2	66.8	79.9	92.7
R	0.01	230.0	389.0	532.0	668.0	799.0	927.0

1/ C = Acceptance number or number of failures permitted. C numbers greater than five shall be coordinated and approved by the qualifying activity.

PAGE 26

4.8.7, second sentence, delete and substitute: "Testing in accordance with 4.8.7.2 is not applicable to groups A, B, C1, or C5."

4.8.7.1b, delete and substitute:

"b. Maximum leakage current. 100 µA. For group A, leakage current measuring device shall be capable of measuring the leakage current to an accuracy of at least 10 percent "

PAGE 27

TABLE VIII, delete and substitute:

"TABLE VIII. Test details for dielectric withstanding voltage.

Points of application	Test voltage
Between case, frame, or enclosure and between all contacts in the energized and de-energized positions (latch and reset positions for latching relays) Between case, frame, or enclosure and coil(s) (latch or reset positions for latching relays) Between all contacts and coil(s) (latch or reset positions for latching relays) Between open contacts in the energized and de-energized positions (latch and reset positions for latching relays) Between coils of latching relays (latch or reset positions for latching relays) Between contact poles in the energized and de-energized positions (latch and reset positions for latching relays) (applicable to multipole relays)	1,000 ±5 percent volts ac plus twice rated voltage or the specified value ±5 percent

"

PAGE 28

4.8.8.2.1a, delete and substitute:

"a. Step up to the specified pickup value (voltage), contacts should have transferred and all normally-open contacts should be making."

PAGE 35

4.8.9c, first sentence, delete "insulation resistance," and "4.8.6".

4.8.9d, delete and substitute:

"d. Examination after test: Relays shall be visually examined for cracking, peeling, and flaking of the finish, and the insulation resistance and dielectric withstanding voltage shall then be measured as specified in 4.8.6 and 4.8.7.1."

PAGE 36

4.8.11.1d, delete and substitute:

"d Tests during vibration: As specified in 4.8.10e."

4.8.11.2d, delete and substitute.

"d. Tests during vibration: As specified in 4.8.10e "

PAGE 44

4.8.20c, delete and substitute·

"c Cycling rate 10 ±2 cycles per minute. Minimum of 75 percent coil "ON" time for nonlatching relays For latching relays, the relay shall be in each position for approximately one half the cycle time Each coil shall be energized for a minimum of 75 percent of each operation "

CONCLUDING MATERIAL

Custodians:
Army - ER
Navy - EC
Air Force - 85
NASA - NA

Review activities.
Army - AR, MI
Navy - AS, MC, OS
Air Force - 17, 19, 99

Preparing activity
DLA - ES

(Project 5945-0965)