

INCH-POUND  
MIL-DTL-13623E  
22 February 2010  
SUPERSEDING  
MIL-DTL-13623D  
7 June 2004

DETAIL SPECIFICATION  
SWITCH, ROTARY: 28 VOLT DC

Inactive for new design after 8 March 1999.

This specification is approved for use by all departments and agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers 28 volt (V) direct current (dc) rotary switches intended primarily for use in tactical vehicles (see [6.1](#)).

1.2 Classification. Switches are of the following types and classes as specified (see [6.2](#)):

- Type I - Single-pole, single throw switches.
- Type II - Single-pole, multi-throw switches.
- Type III - Multipole, single throw switches.
- Type IV - Multipole, multi-throw switches.
- Class 1 - Waterproof.
- Class 2 - Non-Waterproof.
- Class 3 - Non-Waterproof, with sealed (waterproof) shaft.

Comments, suggestions or questions on this document should be addressed to Defense Supply Center Columbus, ATTN: VAT, Post Office Box 3990, Columbus, OH 43218-3990, or emailed to [switch@dla.mil](mailto:switch@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/>.

## 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 SPECIFICATIONS

[A-A-52536](#) - Contact, Electrical No. 12, 14, and 16 A.W.G.

#### FEDERAL STANDARDS

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

#### DEPARTMENT OF DEFENSE SPECIFICATIONS

[MIL-DTL-13486](#) - Cable, Special Purpose, Electrical, Low Tension, Heavy-Duty, Single Conductor and Multiple Conductor, Shielded and Unshielded, General Specification for  
[MIL-DTL-13623/1](#) - Switches, Rotary: 28 Volt DC  
[MIL-DTL-53039](#) - Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant

#### DEPARTMENT OF DEFENSE STANDARDS

[MIL-STD-130](#) - Identification Marking of US Military Property.  
[MIL-STD-202](#) - Electronic and Electrical Component Parts.

(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.)

2.3 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/NCSL Z540-1](#) - Calibration Laboratories and Measuring and Test Equipment, General Requirements for.

INTERNATIONAL ORGANIZATIONS FOR STANDARDS (ISO)

[ISO 10012-1](#) - Quality Assurance Requirements for Measuring Equipment - Part 1: Metrological Confirmation System for Measuring Equipment.

(Copies of these documents are available online at [www.ansi.org](http://www.ansi.org) or from the American National Standards Institute (ANSI), 11 West 42nd Street, New York, NY 10036-8002, telephone 212-642-4900, fax 212-302-1286.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS

[ASTM D5948](#) - Compounds, Molding, Thermosetting  
[ASTM G21](#) - Materials to Fungi, Synthetic Polymeric, Determining Resistance of

(Copies of these documents are available online at [www.astm.org](http://www.astm.org) or from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania, 19428-2959.)

IPC - ASSOCIATION CONNECTING ELECTRONICS INDUSTRIES

[J-STD-006](#) - Electronic Grade Solder Alloys and Fluxed and Non-fluxed Solid Solders for Electronic Soldering Applications Requirements for.

(Copies of these documents are available online at [www.ipc.org](http://www.ipc.org) or from the Association Connecting Electronics Industries, 2215 Sanders Road, Northbrook, Illinois, 60062-6135, United States.)

2.4 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 First article and conformance inspections. First article and conformance inspections and tests shall be required as specified in [4.3](#), [4.4](#) and [4.5](#), respectively. Samples for these tests shall be furnished in accordance with the procedures outlined in [4.4](#) and [4.5](#). The performance of the visual and dimensional inspections, rough handling tests, and leakage tests shall conform to the inspections and test outlined in [4.5.1](#), [4.5.3](#), and [4.5.4](#), respectively.

3.2 Design and construction. Switches and assemblies shall conform to this specification and to [MIL-DTL-13623/1](#), [A-A-52536](#), or, when specified, other applicable standards or drawings (see [4.6.1](#) and [6.2](#)).

3.2.1 Materials. Materials shall be as specified herein, in applicable specifications and drawings or standards. Materials not specifically designated shall be appropriate for use in the assembly conforming to the requirements herein and in applicable specifications (see [4.6.1](#)).

3.2.1.1 Dissimilar metals. Except where necessary to complete an electrical circuit, contact between dissimilar metals, which would encourage galvanic action shall be avoided. Separation of dissimilar metals shall be accomplished by providing insulation between mating surfaces (see [4.6.1](#)).

3.2.1.2 Pure tin. The use of pure tin, as an underplate or final finish, is prohibited both internally and externally. Tin content of switch components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see [6.5](#)).

3.2.2 Clearance. Clearance between any current-carrying and other conducting parts of different potential shall be no less than .062 (1.57mm) inch through air or insulation (see [4.6.1](#)).

3.2.3 Standard parts. Military standard parts shall be incorporated wherever applicable. Commercial standard parts may be used provided they are interchangeable with Military Standard (MS) parts without modification, and the equivalent MS part is identified by the manufacturer (see [4.6.1](#)).

3.2.4 Threaded parts. All screw threads shall conform to [FED-STD-H28](#).

3.2.5 Springs. Springs shall not be used to transmit current (see [4.6.1](#)).

3.2.6 Locking devices. Lockwashers, self-locking nuts, or other approved locking devices shall be incorporated where specified or where required to prevent loosening of components (see [4.6.1](#)).

3.2.7 Solder. Solder shall conform to composition Sn50, Sn60, or Sb5 of [J-STD-006](#). A rosin flux shall be used (see [4.6.1](#)).

3.2.8 Plastic. Molded insulation material shall conform to type MPE requirements of [ASTM-D5948](#) (see [4.6.1](#)).

3.2.9 Cable. Cable shall conform to [MIL-DTL-13486](#) (see [4.6.1](#)).

3.2.10 Interchangeability. The switch shall be interchangeable to the extent that external dimensions shall be within the envelope outline of the applicable drawing or standard. Electrical connectors, shaft and mounting dimensions and location shall conform to the detail requirements of the applicable drawing (see [4.6.2](#)).

3.2.11 Weight. The weight of the switch shall be in accordance with the weight requirements of the applicable drawing (see [4.6.2](#)).

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3.2.12 Terminals. Tip dimensions of round terminals for snap-on connectors shall conform to M827148-3 (see [3.2](#) and [4.6.2](#)).

3.3 Performance. The switch shall perform as specified herein when energized at a rated load of 28 V dc.

3.3.1 Voltage drop. When connected as in use and energized, the voltage drop between terminals shall be no greater than 150 millivolts (see [4.6.1](#) and [6.3.1](#)).

3.3.2 Overload. The switch shall perform as specified in [3.3.1](#) after cycling while connected to loads 40 percent greater than rated loads (see [4.7.2](#)).

3.3.3 Endurance. After 50,000 cycles of operation at rated loads, the voltage drop shall be no greater than 500 millivolts. The torque required to operate the switch shall be no less than 30 ounce-inches (see [3.3.5](#) and [4.7.3](#)).

3.3.4 Dielectric strength. The switch shall perform as specified in [3.3.1](#) and shall evidence no burning, charring, loosening, arcing or other damage to the insulation after operating in each "on" and "off" position with 1000 V root mean square (raw) applied (see [4.7.4](#)).

3.3.5 Torque. The switch shall operate with a torque of not less than 30 ounce-inches nor more than 70 ounce-inches. The switch shall perform as specified herein and evidence no damage after operation with a 3 foot-pound torque (see [4.7.5](#)).

3.3.6 Terminal strength. Terminals of the switch shall perform as specified in [3.3.1](#) and [3.3.4](#) after withstanding perpendicular forces and a longitudinal pull of 25 pounds each (see [4.7.6](#)).

3.3.7 Shock resistance. The switch shall perform as specified in [3.3.1](#) after exposure to shock. The switch shall evidence no mechanical or electrical malfunction (opening or closing of circuit) during and after exposure to 3 sawtooth shock pulses, each of 50 gravities (g) peak amplitude for 7 milliseconds (ins) duration, in each of three orthogonal axes for a total of 18 shock pulses (see [4.7.7](#)).

3.3.8 Vibration resistance. The switch shall perform as specified in [3.3.1](#) and [3.3.5](#) after exposure to vibration for one hour in each of three orthogonal axes for a total of three hours. The vibration shall be an harmonic motion having an amplitude of .03 inch (.06-inch total excursion) in a frequency sweep from 10 to 55 and return to 10 Hertz (Hz) in 1 minute (see [4.7.8](#)).

3.4 Environmental conditions. The switch shall meet the performance specified in [3.3.1](#) after exposure to the range of environmental conditions expected for military usage (see [4.8](#)).

3.4.1 Salt spray resistance. The switch shall perform in accordance with [3.3.1](#) during and after exposure to a fog of atomized salt water of 5 percent salt solution for 200 hours (see [4.8.1](#)).

3.4.2 Sand and dust resistance. The switch shall perform as specified in [3.3.1](#) after exposure to sand and dust in an air velocity of  $2500 \pm 500$  feet per minute (see [4.8.2](#)).

3.4.3 Fungus resistance. The switch shall perform as specified in [3.3.1](#) after exposure to fungus growth for 90 days (see [4.8.3](#)).

3.4.4 Waterproofness. The switch shall be mechanically and electrically operable during and after submersion in saline solution. During submersion, switches shall not leak (see [4.8.4](#)).

3.4.5 Temperature resistance. The switch shall perform as specified in [3.3.1](#) and [3.3.3](#) during and after exposure to extreme temperatures (see [4.8.5](#)).

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3.4.5.1 Low temperature resistance. The switch shall perform as specified herein after exposure at minus 65 + 5 degrees Fahrenheit (F). During exposure to extreme cold the switch shall perform as specified in [3.3.1](#) and the operational torque shall not exceed by more than 40 percent the operational torque of [3.3.5](#) (see [4.8.5.1](#)).

3.4.5.2 High temperature resistance. The switch shall perform as specified in [3.4.5](#) during and after exposure at plus 165 ± 501 (see [4.8.5.2](#)).

### 3.5 Finish.

3.5.1 Color. Unless otherwise specified (see [6.2](#)), switches shall be Forest Green conforming to [MIL-DTL-53039](#) (see [4.6.2](#)).

3.5.2 Plating. When specified (see [6.2](#)) exposed unprotected metal surfaces shall be suitably protected to resist corrosion. (see [4.6.1](#)).

### 3.6 Marking.

3.6.1 Identification marking. Identification marking shall be in accordance with [MIL-STD-130](#) and as a minimum shall include the following (see [4.6.2](#)):

Military Part Number  
Manufacturer's Identification including FSCM  
Manufacturer's Serial Number or date of  
Manufacture (month, year, e.g. Feb 04).

3.6.2 Index marking. Index marking shall be permanent and shall conform to [MIL-STD-130](#) and the applicable military standard or drawing (see [4.6.2](#)).

3.7 Workmanship. Workmanship shall be such as to assure a product free of rust, burrs, scratches, chips and sharp edges (see [4.6.2](#)).

## 4. VERIFICATION

4.1 Inspection equipment. Unless otherwise specified in the contract (see [6.2](#)), test and measuring equipment and inspection facilities of sufficient accuracy, quality, and quantity to permit performance of the required inspection shall be established and maintained by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with [ANSI/NCSL Z540-1](#), [ISO 10012-1](#) or approved equivalent.

### 4.2 Classification of inspection:

- a. First article inspection (see [4.4](#)).
- b. Conformance inspection (see [4.5](#)).
- c. Control tests (see [4.5.3](#)).

4.3 Inspection conditions. Unless otherwise specified (see [6.2](#)), all inspections shall be conducted under the following conditions:

- a. Air temperature 77 ± 15°F
- b. Barometric pressure 725 + 50/-75 millimeter (mm) mercury (Hg)
- c. Relative humidity 50 ± 30 percent

4.4 First article inspection. Unless otherwise specified (see [6.2](#)), the Government shall select six switches produced under the production contract for first article inspection. First article testing shall be conducted by the contractor under Government surveillance, and shall consist of examination for classification of defects specified in [4.5.2](#) and testing specified in [table I](#) in the order listed on [table II](#). Approval of the first article sample by the Government shall not relieve the contractor of his obligation to supply regulator assemblies that are fully representative of those inspected as a first article sample. Any changes or deviation of the production units from the first article sample shall be subject to the approval of the contracting officer.

4.4.1 First article inspection failure. Test item deficiencies during, or as a result of, the first article test, shall be cause for rejection of the items until evidence has been provided by the contractor that corrective action has been taken to eliminate the deficiency. Any deficiency found during, or as a result of the first article test, shall be evidence that all items already produced prior to completion of the first article test are similarly deficient unless contrary evidence satisfactory to the contracting officer is furnished by the contractor. Such deficiencies on all items shall be corrected by the contractor. The Government shall not accept products until first article testing is completed to the satisfaction of the Government.

4.5 Conformance inspection.

4.5.1 Sampling.

4.5.1.1 Lot formation. An inspection lot shall consist of all the switches of one type and part number, from an identifiable production period, from one manufacturer, submitted at one time for acceptance.

4.5.2 Examination. Conformance to [3.2.10](#) through [3.2.12](#), [3.5](#), [3.6](#) and [3.7](#) shall be determined by examination for the defects. Examination shall be visual, tactile, or by measurement with standard inspection equipment.

4.5.3 Control tests. Control tests shall be conducted on two switches from each lot of 500 switches consecutively produced, except that not more than four nor less than two switches shall be subjected to control testing in any 90 day period. The control test samples shall be identified as to production period and, after having been examined in accordance with [4.5.2](#), they shall be subjected to the control tests specified in [table I](#) in the following order: [4.7.1](#) and again after each test, [4.7.8](#), [4.8.4](#), and [4.7.3](#).

4.5.4 Failure. Failure of any switches to pass any of the specified quality conformance or control tests shall be cause for the Government to refuse acceptance of the production quantity represented, until action taken by the contractor to correct defects and prevent recurrence has been approved by the Government.

4.6 Methods of inspection.

4.6.1 Materials and construction. Conformance to [3.2](#) through [3.2.9](#) and [3.5.2](#) shall be determined by inspection of contractor records providing proof or certification that design, construction, processing, and materials conform to requirements. Applicable records shall include drawings, specifications, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and rating data.

4.6.2 Failures. Conformance to [3.2.10](#) through [3.2.12](#), [3.5.1](#), and [3.6.1](#) through [3.7](#) shall be determined by examination. Examination shall be visual, tactile, or by measurement with standard inspection equipment.

4.7 Inspection for performance.

4.7.1 Voltage drop. To determine conformance to [3.3.1](#), the switch shall be energized by a 28 V dc source and connected to the rated loads specified on the applicable drawing (see [3.2](#)). Measure the terminal-to-terminal voltage. Verify that the voltage drop is not greater than 150 millivolts.

4.7.2 Overload. To determine conformance to [3.3.2](#), the switch shall be energized by a 28 V dc source and connected to loads 40 percent greater than rated (lamp, resistive, and inductive) loads. The switch shall be operated for 100 cycles at each specified load. For lamp loads, the load cycle shall be  $1 \pm 0.1$  second "on" and  $5 \pm 0.1$  seconds "off" (10 cycles per minute). The inductive load shall be  $3 \pm 0.1$  seconds "on" and  $3 \pm 0.1$  seconds "off" (10 cycles per minute). After cycling is completed test the switch as specified in [4.7.1](#).

4.7.3 Endurance. To determine conformance to [3.3.3](#), the switch shall be energized by a 28 V dc source and connected to the rated loads specified on the applicable drawing (see [3.2](#)) and operated for 50,000 cycles. During testing, the switch shall show no evidence of malfunction. After the 50,000- cycle operation, measure the terminal-to-terminal voltage. Verify that voltage drop is not greater than 500 millivolts. Mount the switch as in [4.7.5](#). Verify that the torque required to operate the switch after the 50,000-cycle operation is not less than 30 ounce-inches.

4.7.4 Dielectric strength. To determine conformance to [3.3.4](#), the switch shall be tested as specified in [MIL-STD-202, Method 301](#). Applied voltage shall be 1000 V r<sub>aw</sub> at a frequency of 60 cycles per second with the switch lever in each of its "on" and "off" positions. The voltage shall be increased 400 V per second between terminals and between insulated terminals and ground for one minute on each application. Verify that there is no evidence of burning, charring, loosening, arcing or other damage to the insulation.

4.7.5 Torque. To determine conformance to [3.3.5](#), the switch shall be secured to a fixture simulating mounting as in intended use and fitted with an operating lever, then tested as follows:

- a. A force shall be applied to produce the torque required to move the switch from "on" or "off" position as in intended use. The operating torque shall be the average of five measurements of the torque applied for each direction of movement from each position. Verify that the torque is not less than 30 nor more than 70 ounce-inches.
- b. With the lever turned to each extreme position a force shall be applied in the direction affording maximum leverage such that a torque load of 3 foot-pounds is applied to the switch. This load shall be applied gradually five times for each lever position and held for at least 10 seconds. Verify that the switch evidences no breakage, distortion, or loosening of parts. After testing for both operating torque and maximum torque, verify that the voltage drop requirement is maintained by testing as specified in [4.7.1](#).

4.7.6 Terminal strength. To determine conformance to [3.3.6](#), the switch shall be mounted as in intended use and a force of 25 pounds shall be applied at the base of all terminals in four directions perpendicular to the longitude centerline of the terminals at 90 intervals. In addition a 25 pound pull shall be applied along the terminal axes centerline. Force and pull shall be applied for 10 seconds each. Verify that there is no evidence of damage, distortion or loosening of parts. Subsequently the switch shall be tested per [4.7.1](#) and [4.7.4](#) to verify that voltage drop and dielectric strength requirements are maintained.

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TABLE I. Classification of inspections.

Title	Requirement	Inspection	Qualification	Quality conformance		Control
				Examination	Tests	
Materials and construction	<a href="#">3.2</a> - <a href="#">3.2.9</a> and <a href="#">3.5.2</a>	<a href="#">4.6.1</a>	X			
Defects	<a href="#">3.2.10</a> - <a href="#">3.2.12</a> , <a href="#">3.5.1</a> , and <a href="#">3.6.1</a> - <a href="#">3.7</a>	<a href="#">4.6.2</a>	X	X		
Voltage drop	<a href="#">3.3.1</a>	<a href="#">4.7.1</a>	X			X
Overload	<a href="#">3.3.2</a>	<a href="#">4.7.2</a>	X			X
Endurance	<a href="#">3.3.3</a>	<a href="#">4.7.3</a>	X			X
Dielectric strength	<a href="#">3.3.4</a>	<a href="#">4.7.4</a>	X			
Torque	<a href="#">3.3.5</a>	<a href="#">4.7.5</a>	X		X	
Terminal strength	<a href="#">3.3.6</a>	<a href="#">4.7.6</a>	X		X	
Shock resistance	<a href="#">3.3.7</a>	<a href="#">4.7.7</a>	X			
Vibration resistance	<a href="#">3.3.8</a>	<a href="#">4.7.8</a>	X			X
Environmental conditions	<a href="#">3.4</a>	<a href="#">4.8</a>	Xx			
Salt spray resistance	<a href="#">3.4.1</a>	<a href="#">4.8.1</a>	X			
Sand and dust resistance	<a href="#">3.4.2</a>	<a href="#">4.8.2</a>	X			
Fungus resistance	<a href="#">3.4.3</a>	<a href="#">4.8.3</a>	X			
Waterproofness	<a href="#">3.4.4</a>	<a href="#">4.8.4</a>	X			X
Temperature resistance	<a href="#">3.4.5</a>	<a href="#">4.8.5</a>	X			
Low temperature resistance	<a href="#">3.4.5.1</a>	<a href="#">4.8.5.1</a>	X			
High temperature resistance	<a href="#">3.4.5.2</a>	<a href="#">4.8.5.2</a>	X			

TABLE II. Order of first article tests.

Sample number	Paragraph number	Test sequence
1 and 2	<a href="#">4.7.1</a>	Voltage drop
	<a href="#">4.7.6</a>	Terminal strength
	<a href="#">4.7.7</a>	Shock resistance
	<a href="#">4.7.8</a>	Vibration resistance
	<a href="#">4.8.4</a>	Waterproofness
	<a href="#">4.7.1</a>	Voltage drop
	<a href="#">4.8.3</a>	Fungus resistance
	<a href="#">4.7.4</a>	Dielectric strength
	<a href="#">4.7.5</a>	Torque
	<a href="#">4.7.1</a>	Voltage drop
3 and 4	<a href="#">4.7.1</a>	Voltage drop
	<a href="#">4.7.5</a>	Torque voltage drop
	<a href="#">4.7.1</a>	Voltage drop
	<a href="#">4.8.5</a> , <a href="#">4.8.5.1</a> and <a href="#">4.8.5.2</a>	Temperature resistance
	<a href="#">4.7.2</a>	Overload
	<a href="#">4.8.1</a>	Salt spray resistance
5 and 6	<a href="#">4.7.4</a>	Dielectric strength
	<a href="#">4.7.1</a>	Voltage drop
	<a href="#">4.8.2</a>	Sand and dust resistance
	<a href="#">4.7.3</a>	Endurance
	<a href="#">4.7.4</a>	Dielectric strength

4.7.7 Shock resistance. To determine conformance to [3.3.7](#), the switch shall be mounted and electrically connected in a fixture to simulate mounting in intended use. Subject the switch to three sawtooth shock pulses of 50 g peak amplitude of 7 ms duration in each of three major axes for a total of 18 shock pulses. One axis shall be through or parallel to the plane of contact movement and the lever when in "off" position. This test shall conform to [MIL-STD-202, method 213](#). The shock-testing apparatus shall be constructed with a non-yielding base and a stationary anvil. Verify that there is no evidence of electrical or mechanical malfunction during and after this shock test.

4.7.8 Vibration resistance. To determine conformance to [3.3.8](#), the switch shall be mounted and electrically connected as in intended use and subjected to the vibration test specified in [method 201 of MIL-STD-202](#), except that vibration shall be for one hour along each of three mutually perpendicular axes, one of which shall be through or parallel to the switch shaft. Verify that there is no evidence of electrical or mechanical malfunction. Subsequently the switch shall be tested for operating torque per [4.7.5\(a\)](#) and for voltage drop per [4.7.1](#).

4.8 Environmental conditions. The switch shall be tested per [4.7.1](#) after exposure to the environmental tests listed herein.

4.8.1 Salt spray resistance. To determine conformance to [3.4.1](#), the switch shall be tested as specified in [MIL-STD-202, method 101](#), except that the test duration shall be 200 hours. A 5 percent salt solution shall be used.

4.8.2 Sand and dust resistance. To determine conformance to [3.4.2](#), the switch shall be tested as specified in [MIL-STD-202, method 110](#) except that steps 1 through 4 shall be deleted from the procedure and parts I and II below shall apply instead. No electrical load shall be connected to the terminals during this test.

Part I. The specimen shall be placed on a test chamber which has been vented to the atmosphere. The internal temperature of the chamber shall be maintained at 25C (77°F) with a relative humidity that shall not exceed 30 percent at any time during test. The sand and dust density shall be raised and maintained at 0.1 to 0.5 gram per cubic foot within the test space. The sand and dust velocity through the test chamber shall be 2500 ± 500 feet per minute. This portion of the test shall be continued for 6 hours.

Part II. At the completion of the 6-hour period stated in part I the temperature shall then be raised to and maintained at 71°C (160°F) for an additional 6 hours with all other conditions remaining the same as in part I.

4.8.3 Fungus resistance. To determine conformance to [3.4.3](#), the switch shall be subjected to the fungus resistance test of [ASTM-G21](#). Fungal incubation shall be for 90 days per method B for class 2 specimens.

4.8.4 Waterproofness. To determine conformance to [3.4.4](#), the switch shall be tested by submersion as specified in [4.8.4.1](#). Subsequently, verify that the switch is operable.

#### 4.8.4.1 Waterproofness test method

4.8.4.1.1 Step 1. Prior to submersion, the sample switch shall be installed in a test circuit equivalent to the normal dry environment and operating both mechanically and electrically, as applicable, for a period of 30 minutes at full rated current and voltage.

4.8.4.1.2 Step 2. The component with its electrical connections shall be submerged in a container with the uppermost surface a minimum of one inch below the surface of the saline solution and installed in the chamber. The component shall be carefully observed during its entire period of submersion and shall be operated while submerged for 30 minutes at full rated current and voltage. The chamber shall be evacuated to a pressure six pounds below atmospheric so as to apply a minimum of six pounds per square inch (psi) in internal pressure to all voids within the component. During this period the component shall be carefully observed for poor seals, as evidenced by bubbles escaping from the interior of the component (see [4.8.4.1.5](#)). Leakage thus indicated shall be considered as noncompliance with the waterproofness requirement and the component shall be rejected. Bubbles that are the result of entrapped air on the exterior surfaces of the component shall not be considered a leak.

4.8.4.1.3 Step 3. The chamber shall then be pressurized to six pounds above atmospheric and the component again operated for 30 minutes. Test results obtained shall be compared with the data from the test of [4.4](#).

4.8.4.1.4 Step 4. The switch shall evidence no leakage and shall be mechanically and electrically operable during and subsequent to submersion, when subjected to the tests specified in [4.8.4.1.2](#) and [4.8.4.1.3](#).

4.8.4.1.5 Step 5. The term "leakage", as used in this document, is intended to mean that there shall be no bubbles escaping from the interior of the component when the test chamber is evacuated to a pressure six pounds below atmospheric

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4.8.5 Temperature resistance. To determine conformance to [3.4.5](#), the switch shall be tested at extremes of low and high temperature as specified in [4.8.5.1](#) and [4.8.5.2](#). During each of these tests the switch shall be energized by a 28 V dc source and connected to the rated loads specified on the applicable drawing. The switch shall be operated through its entire range 1000 times. For lamp loads, the load cycle shall be  $1 \pm 0.1$  seconds "on" and  $5 \pm 0.1$  seconds "off" (10 cycles per minute). The inductive load shall be  $3 \pm 0.1$  seconds "on" and  $3 \pm 0.1$  seconds "off" (10 cycles per minute). The switch shall then be tested for operating torque in accordance with [4.7.5\(a\)](#). These tests shall be performed in a chamber capable of maintaining air temperatures of minus 65°F and plus 165°F. Air movement during high temperature exposure shall be held to a minimum to prevent a temperature gradient and any cooling resulting from excess air motion.

4.8.5.1 Low temperature. To determine conformance to [3.4.5.1](#), the switch shall be placed in a cold chamber and conditioned for 24 hours prior to testing at minus  $65 \pm 5^\circ\text{F}$ . Then, with the chamber temperature constant at minus  $65 \pm 5^\circ\text{F}$ , the switch shall be operated and tested as specified in [4.8.5](#). Verify that operating torque conforms to [3.4.5.1](#) and that there is no degradation of electrical and mechanical performance.

4.8.5.2 High temperature. To determine conformance to [3.4.5.2](#), the switch shall be conditioned and tested as specified in [4.8.5.1](#), except that constant temperature shall be plus  $165 \pm 5^\circ\text{F}$ .

## 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

6.1 Intended use. Rotary switches covered by this specification are intended primarily for use on tactical vehicles.

6.1.1 Class 3 switches. Switches that are non-waterproof, except that operating shaft resists entry of water, are for installation as components of sealed, waterproof assemblies containing non-waterproof items enclosed in waterproof housings.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type and class of switch (see [1.2](#)).
- c. If first article inspection is not required or is other than as specified (see [3.1](#) and [4.4](#)).
- d. Applicable drawings if required (see [3.2](#)).
- e. If color other than specified is required (see [3.5.1](#)).
- f. Any special plating requirements (see [3.5.2](#)).
- g. If inspection conditions are other than as specified (see [4.3](#)).
- h. Selection of applicable level and packaging standard or packaging data sheet (see [5.1](#)).

6.3 Definition.

6.3.1 Voltage drop. When the switch is built with permanently attached flexible tails) and the switch terminals have been sealed (as with a molded sealant or potting compound), it may be necessary to measure total conductor terminal or conductors terminal drop and make necessary allowance for conductor voltage drop (see [3.3.1](#) and [4.7.1](#)).

6.4 Switch lever. A lever is not supplied as part of the switch. The lever required will be determined by type of engine (gasoline or multifuel) on which the switch is used (see [3.2](#)).

6.5 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).

6.6 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).

6.7 Subject term (key word) listing.

single-pole, single throw  
single-pole, multi-throw  
multipole, single throw  
multipole, multi-throw  
waterproof  
non-waterproof  
non-waterproof, with sealed (waterproof) shaft

6.8 Recycled materials. The use of recycled materials which meet the requirements of the applicable material specifications without jeopardizing the intended use are encouraged (see [3.2](#)).

6.9 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.

Custodian:  
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Preparing activity:  
DLA - CC

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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/> .