

DETAIL SPECIFICATION

SWITCHES, PULL; SWITCHES, PUSH; SWITCHES, BEAM SELECTING, HEADLIGHT: ELECTRICAL (28 VOLTS DC MAXIMUM, FOR MILITARY VEHICLES)

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) maximum, push, pull, and headlight beam-selecting switches (see [6.1](#)).

1.2 Classification. Switches should be of the following types, arrangements, classes, and grades, in the combinations specified (see [table I](#) and [6.2](#)).

1.2.1 Types.

Type I	Push; single-pole, single-throw, momentary operation, light duty.
Type II	Beam selecting, headlight; single-pole, double-throw.
Type III	Beam selecting, headlight; multi-pole, double-throw.
Type IV	Push; single-pole, single-throw, momentary operation, heavy duty.
Type V	Pull; single-pole, single-throw, pull-latch disconnect.

1.2.2 Arrangements.

Arrangement 1: Normally open.
Arrangement 2: Normally closed.
Arrangement 3: No open.

1.2.3 Classes.

Class A: Slow make and break.
Class B: Fast make and break.

1.2.4 Grades.

Grade 1: Watertight (operable during immersion).
Grade 2: Open (waterproof, but not operable during immersion).

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. 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>.

TABLE I. Combination of types, arrangements, classes, and grades.

Type	Arrangement			Class		Grade	
	1	2	3	A	B	1	2
I	x			x		x	
I	x			x			x
I	x				x	x	
I	x				x		x
I		x		x		x	
I		x		x			x
I		x			x	x	
I		x			x		x
II			x		x	x	
III			x		x	x	
IV	x			x		x	
IV	x			x			x
V			x	x			x

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](#) - Cables, Special Purpose, Electrical, Low-Tension, Heavy-Duty, Single Conductor and Multiple Conductor, Shielded and Unshielded, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

[MIL-STD-130](#) - Identification Marking of US Military Property.
[MIL-STD-810](#) - Environmental Engineering Considerations and Laboratory Tests.
[MIL-STD-889](#) - Dissimilar Metals

(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 - General Requirements for Calibration Laboratories and Measuring and Test Equipment.

(Copies of these documents are available online at <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.)

INTERNATIONAL ORGANIZATION FOR STANDARDS (ISO)

ISO 10012-1 - Quality Assurance Requirements for Measuring Equipment – Part 1, Meteorological Confirmation System for measuring Equipment

(Copies of these documents are available online at <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.)

IPC - ASSOCIATION CONNECTING ELECTRONICS INDUSTRIES

J-STD-004 - Soldering Fluxes Requirements for.

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 <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 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 switches furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable Qualified Products List (QPL) before contract award (see [4.2](#) and [6.4](#)).

3.3 Design and construction. The switch shall be constructed to the form and dimension specified on the applicable military standards or drawings (see [2.2](#) and [4.5.10](#)).

3.3.1 Interchangeability. To provide for interchangeability, switches fabricated in accordance with this specification shall have external dimensions that fall within the envelope outline of the applicable military standards or drawings. Electrical connectors, mounting dimensions, and location shall also conform to the detail requirements of the applicable document (see [4.5.10](#)).

3.3.2 Materials. Materials shall be as specified herein, on applicable standards or drawings, and in applicable specifications (see [4.5.10](#)).

3.3.2.1 Metals. Exterior metals shall be of a corrosion-resistant type or shall be treated to resist corrosion (see [4.5.9](#)).

3.3.2.2 Dissimilar metals. Except where necessary to complete an electrical circuit, contact between dissimilar metals as defined in [MIL-STD-889](#), which would encourage galvanic action, shall be avoided. Separation of dissimilar metals shall be accomplished by providing insulation between mating surfaces (see [4.5.9](#)).

3.3.2.3 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 [6.3.1](#)).

3.3.3 Standard parts. Military standard parts shall be used wherever applicable. Commercial standard parts may be used provided they are interchangeable without modification with the military standard parts they replace (see [4.5.9](#)).

3.3.4 Threaded parts. All screw threads shall conform to [FED-STD-H28](#) (see [4.5.10](#)).

3.3.5 Springs. Springs shall not be used to transmit current (see [4.5.9](#)).

3.3.6 Locking devices. Lock washers, self-locking nuts, or other approved locking devices shall be incorporated where specified or where required to prevent loosening of components (see [4.5.9](#)).

3.3.7 Solder and soldering flux. Solder, when used for electrical connections, shall be composition Sn60 in accordance with [J-STD-006](#), and soldering flux shall be in accordance with [J-STD-004](#). (see [4.5.10](#)).

3.3.8 Terminals. Unless otherwise specified (see [6.2](#)), tip dimensions of round terminals for snap-on connectors shall conform to [A-A-52536](#) (see [4.5.10](#)).

3.3.9 Cable. Unless otherwise specified on the applicable military standard or drawing, the electrical lead cable shall conform to [MIL-DTL-13486](#) (see [4.5.10](#)).

3.3.10 Weight. The weight of the switch shall not exceed that specified on the applicable military standard or drawing (see [4.5.10](#)).

3.4 Performance.

3.4.1 Overload force. When tested as specified in [4.5.6.1](#), the overload force ("minimum pressure") specified on the applicable military standard or drawing shall cause no switch damage. The switch shall subsequently meet the requirements of [3.4.2](#).

3.4.2 Operating force. When tested as specified in [4.5.6.2](#), the average force ("pressure") required to actuate or close the switch shall be within the limits specified on the applicable military standard or drawing.

3.4.3 Contact voltage drop. When tested as specified in the applicable portions of [4.5.6.3](#), and determined as specified in [4.5.6.3.2](#), the contact voltage drop shall not exceed 60 millivolts, except as specified in [3.4.6](#) for endurance test specimens.

3.4.4 Electrical overload. When tested as specified in [4.5.6.4](#), the switch shall carry a current equal to 150 percent of the applicable rated load without damage and shall subsequently meet the requirements of [3.4.3](#).

3.4.5 High voltage. When tested as specified in [4.5.6.5](#), the switch shall evidence no sparking, arcing, burning, smoking, charring, cracking, loosening, rupturing, or other damage to the insulation.

3.4.6 Endurance. When tested as specified in [4.5.6.6](#), the switch shall show no evidence of mechanical or electrical failure. After the test, the contact voltage drop, measured as specified in the applicable portions of [4.5.6.3](#) and determined as specified in [4.5.6.3.2](#), shall not exceed 120 millivolts and shall subsequently meet the requirements of [3.4.2](#) and [3.4.5](#).

3.5 Environmental.

3.5.1 Salt fog (corrosion). When tested as specified in [4.5.7.1](#), the switch shall evidence no corrosion affecting operation and shall subsequently meet the requirements of [3.4.2](#), [3.4.3](#), and [3.4.5](#).

3.5.2 Fungus. When tested as specified in [4.5.7.2](#), the switch shall evidence no fungus growth affecting operation and shall subsequently meet the requirements of [3.4.2](#), [3.4.3](#), and [3.4.5](#).

3.5.3 Waterproofness. The switch assembly shall evidence no leakage and shall be mechanically and electrically operable during and subsequent to submersion, when subjected to test specified in [4.5.7.3](#).

3.5.4 Extreme temperatures. When tested as specified in [4.5.7.4](#), the switch shall operate in a temperature range of -65°F through +165°F. While at -60°F ± 5°F, the minimum force required to actuate or close the switch shall be no more than 40 percent higher than the average actuation force previously measured at room temperature (see [table II](#), specimens 3 and 4). The switch shall subsequently meet the requirements of [3.4.2](#) and [3.4.3](#).

3.6 Physical.

3.6.1 Shock. When tested as specified in [4.5.8.1](#), the switch shall evidence no mechanical or electrical malfunction (opening or closing of circuits). After shock test, switches shall have no loosened, distorted, or broken parts.

3.6.2 Vibration. When tested as specified in [4.5.8.2](#), the switch shall evidence no mechanical or electrical malfunction (opening and closing of circuits). After vibration test, switches shall have no loosened, distorted, worn, or broken parts and shall subsequently meet the requirements of [3.4.2](#) and [3.4.3](#).

3.6.3 Terminal strength. When tested as specified in [4.5.8.3.1](#), terminals of switches with receptacle (mating) connectors shall withstand a force of 40 pounds. When tested as specified in [4.5.8.3.2](#), the terminals and lead connections of switches with permanently attached leads shall withstand a force of 40 pounds. When tested as specified in [4.5.8.3.3](#), switches with screw type terminals shall withstand the minimum torque necessary to seat the outermost nut properly. No switch, regardless of terminal construction, shall have any deformation of more than .062 inch (1.57 mm) or any rotation of more than 15° after the test. Each switch, regardless of terminal construction, shall subsequently meet the requirements of [3.4.3](#).

3.7 Finish. Cleaning, pretreatment, priming, and painting shall conform to best commercial practices (see [4.5.10](#)).

3.8 Marking.

3.8.1 Identification marking. Identification marking shall be in accordance with [MIL-STD-130](#) and as a minimum shall include the following (see [4.5.10](#)).

Applicable Military Standard or drawing number
Manufacturer's Name or Identification
Date of Manufacture (month, year; e.g., June 85)

3.9 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.

3.10 Workmanship. Workmanship shall be such as to assure a product free of burrs, rust, scratches, chips, sharp edges, loose or defective connectors, cracked insulation, or faulty soldering (see [4.5.10](#)).

4. VERIFICATION

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

- a. Qualification inspection (see [4.2](#)).
- b. Conformance inspection (see [4.3](#)).

4.2 Qualification inspection. A qualification sample of eight switches (see [3.1](#)) shall be submitted for qualification testing. The samples shall be representative of the units proposed to be furnished under the contract. Qualification inspection shall be performed at a laboratory acceptable to the Government (see [6.3](#)) on sample units produced with equipment and procedures normally used in production.

4.2.1 Failure. Failure of any qualification test sample to pass any of the examinations or tests specified herein may be cause, at the option of the Government, for refusal to conduct additional testing until the faults revealed by the test have been corrected.

4.3 Conformance inspection.

4.3.1 Sampling.

4.3.1.1 Inspection lot. A lot shall consist of all switches of one Part or Identifying Number (PIN), from an identifiable production period, from one manufacturer, submitted at one time for acceptance.

4.3.1.2 Sampling for examination. Samples for conformance examination shall be as specified in [table III](#).

TABLE II. Order of qualification testing.

Sample number	Paragraph number	Test sequence
1 and 2	4.5.6.3	Contact voltage drop
	4.5.6.2	Operating force
	4.5.8.3	Terminal strength
	4.5.6.3	Contact voltage drop
	4.5.8.1	Shock
	4.5.8.2	Vibration
	4.5.6.2	Operating force
	4.5.6.3	Contact voltage drop
	4.5.7.3	Waterproofness
3 and 4	4.5.6.5	High voltage
	4.5.6.3	Contact voltage drop
	4.5.6.2	Operating force
	4.5.7.4.1	Low temperature operation
	4.5.7.4.2	High temperature operation
	4.5.6.2	Operating force
	4.5.6.3	Contact voltage drop
	4.5.6.4	Electrical overload
	4.5.6.3	Contact voltage drop
	4.5.7.1	Salt fog (corrosion)
4.5.6.5	High voltage	
5 and 6	4.5.6.3	Contact voltage drop
	4.5.6.2	Operating force
	4.5.6.6	Endurance
	4.5.6.2	Operating force
	4.5.6.5	High voltage
7 and 8	4.5.6.3	Contact voltage drop
	4.5.6.2	Operating force
	4.5.6.1	Overload force
	4.5.6.2	Operating force
	4.5.7.2	Fungus
	4.5.6.5	High voltage
	4.5.6.3	Contact voltage drop
	4.5.6.2	Operating force

TABLE III. Sampling plan.

Lot Size	Number of switches to be tested
1 - 5	All
6 - 12	5
13 - 50	6
51 - 90	7
91 - 150	11
151 - 280	13
281 - 500	16
501 - 1200	19
1201 - 3200	23
3201 - 10000	29
10001 and over	35

4.3.3 Testing.

4.3.3.1 Conformance inspection. Samples selected in accordance with [4.3.1.2](#) shall be subjected to the tests specified in [table IV](#).

TABLE IV. Order of conformance inspection.

Paragraph number	Test sequence
4.5.8.3	Terminal strength
4.5.6.2	Operating force

4.4 Control test.

4.4.1 Sampling for control tests. The control test sample shall be identified as to production period and after having been examined for the defects specified in [4.4.2](#), they shall be subjected to the tests specified in [table V](#) in the order listed.

TABLE V. Order of control testing.

Sample no.	Paragraph no.	Test sequence
All	4.5.6.2	Operating force
	4.5.6.3	Contact voltage drop
	4.5.6.4	Electrical overload
	4.5.7.3	Waterproofness
	4.5.6.3	Contact voltage drop

4.4.2 Failure. Failure of any control test sample to pass any examination or test specified herein may be cause, at the option of the Government, for refusal to accept subsequent lots until the faults revealed by the test have been corrected.

4.5 Test procedures.

4.5.1 General.

4.5.1.1 Conditions. Tests shall be conducted under general laboratory conditions acceptable to the Government. Unless otherwise specified in the individual test procedures, switches shall be temperature stabilized at 77°F ±15°F and tests shall be conducted at an ambient of 77°F ±15°F. However, soaking need not be repeated where tests are continuous at that temperature.

4.5.1.2 Apparatus. In addition to standard measuring equipment (see [table VI](#) and applicable test specifications), test apparatus shall include a testing chamber capable of maintaining specified air temperatures over the range from -65°F to +165°F. Air movement in the high temperature chamber shall be held to a minimum to prevent a temperature gradient within the chamber and any cooling resulting from excess air motion. There shall also be a submersion tank capable of producing and maintaining a pressure of 6 pounds per square inch (psi) and vacuum of 6 psi.

4.5.1.3 2 Test equipment and inspection facilities. 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.

TABLE VI. Measuring instrument tolerances.

Measuring instrument	Accuracy - maximum
Voltmeter DC	± 0.50 percent
Ammeter DC (multi-range)	± 0.50 percent
Millivoltmeter	± 0.50 percent

4.5.2 Load. Electrical loads specified in the individual test procedures shall be in accordance with [4.5.2.1](#) or [4.5.2.2](#) as applicable. Switches shall be designed to conduct continuously, the load currents specified on the applicable military standard or drawing.

4.5.2.1 Type I, IV, and V switches. The ampere rating shall be as specified on the applicable military standard or drawing.

4.5.2.2 Type II and III switches. The noted lamp load specified on the applicable military standard or drawing shall be used with type II and III switches. Indicator lamps shall not be considered loads.

4.5.3 Switch operation. When cycling is required, power driven switch operating mechanism shall be used to apply a constant force within the operating force ("pressure") requirements specified on the applicable military standard or drawing, to the switch operating area or handle. Type V switches shall be operated by alternately pulling and releasing the handle (the handle need not be twisted).

4.5.3.1 Switch operating definitions. See [6.3](#)

4.5.4 Cycle for type I, IV, and V switches. A cycle shall consist of the following sequence: 3.0 ± 0.1 seconds in "on" position, 3.0 ± 0.1 seconds in "off" position (10 cycles per minute).

4.5.5 Cycle for type II and III switches. A cycle shall consist of the following sequence: 1.0 ± 0.1 seconds in "on" position, 5.0 ± 0.1 seconds in "off" position (10 cycles per minute.)

4.5.5.1 Electrical circuit for type II and III switches. An "on" position and an "off" position shall be provided for cycling, by connecting one (outgoing) terminal which is normally connected to a load in intended operation, to the load specified in [4.5.2](#). The appropriate (feed) terminal shall be connected to the source. The remaining terminals shall not be connected.

4.5.6 Performance.

4.5.6.1 Overload force. To determine conformance to [3.4.1](#), the overload force specified therein shall gradually be applied to the switch actuating area or switch handle, as applicable, in the direction of travel. The force shall then be released. This process shall be repeated four (more) times.

4.5.6.2 Operating force. To determine conformance to [3.4.2](#), a force shall gradually be applied to the switch actuating area or switch handle, as applicable, until the switch reaches full travel position (class A switches), or actuate (class B switches). The force shall then be released. This process shall be repeated nine (more) times. The average force required to actuate the switch or to cause it to reach full travel position, as applicable, shall be computed and recorded.

4.5.6.3 Contact voltage drop. To determine conformance to [3.4.3](#), the switch shall be tested as indicated in [4.5.6.3.1](#). The test shall be conducted in accordance with [4.5.6.3.1.1](#), if applicable. The contact voltage drop shall be determined as specified in [4.5.6.3.2](#).

4.5.6.3.1 Test procedure. Each terminal which is connected to a load in intended operation shall be connected to the applicable load specified in [4.5.2](#). Each appropriate terminal shall be connected to a voltage source. With the switch in each closed position, the voltage drop shall be measured between each appropriate pair of terminals.

4.5.6.3.1.1 Momentary operation switches. If the switch is of arrangement 1 and, further, is type I or type IV (momentary operation), the test specified in [4.5.6.3.1](#) shall be performed with the applicable one of the following forces applied to the actuating area:

Type I, arrangement 1	-	15 pounds
Type IV	-	40 pounds
Type IV (8328134) only	-	40 ± 5 pounds actuating force plus 40 ± 5 pounds operating force

4.5.6.3.2 Determination of contact voltage drop. If the switch has leads permanently attached to the switch body, the contact voltage drop shall be determined by subtracting lead voltage drop from the measured voltage drop. Otherwise the contact voltage drop shall be considered to be the terminal to terminal voltage drop (type I, IV, and V switches) or the maximum terminal to terminal voltage drop (type II or III switches).

4.5.6.4 Electrical overload. To determine conformance to [3.4.4](#), the switch shall be connected to 150 percent of the applicable load specified in [4.5.2](#), and operated for 100 cycles as specified in the applicable requirements of [4.5.4](#) or [4.5.5](#).

4.5.6.5 High voltage. To determine conformance to [3.4.5](#), 440 V root mean square (rms) at 60 cycles per second (cps) shall be applied for 1 minute to the switch between each appropriate pair of leads with the contacts in the corresponding open position.

4.5.6.6 Endurance. To determine conformance to [3.4.6](#), the switch shall be connected to a load as specified in [4.5.2](#) and operated for 50,000 cycles in accordance with the applicable requirements of [4.5.4](#) or [4.5.5](#). During the test, the switch shall be periodically observed for evidence of malfunction.

4.5.7 Environmental.

4.5.7.1 Salt fog (corrosion). To determine conformance to [3.5.1](#), the switch shall be subjected to the salt fog test specified in [method 509, procedure I, of MIL-STD-810](#), except that the duration of the test shall be 200 hours. Immediately upon completion of this test, the switches shall be rinsed in lukewarm water and the temperature stabilized, then tested as specified in [4.5.6.2](#), [4.5.6.3](#), and [4.5.6.5](#).

4.5.7.2 Fungus. To determine conformance to [3.5.2](#), the switch shall be subjected to the fungus test specified in [method 508, procedure I, of MIL-STD-810](#), except that the test duration shall be continuous for 90 days. However, the switches may be inspected periodically for fungus growth.

4.5.7.3 Waterproofness. To determine conformance to [3.5.3](#), grade 1 switches shall be subjected to the waterproofness test of [4.5.7.3.1](#) and grade 2 switches shall be subjected to the test of [4.5.7.3.2](#)

4.5.7.3.1 Grade 1 switches.

- a. The switch assembly shall be installed in a test circuit equivalent to the assemblies' normal dry environment. The assembly shall then be operated both electrically and mechanically for a period of 30 minutes at full rated current and voltage with the results recorded.
- b. The switch assembly shall then be submerged in a container with the uppermost surface a minimum of one inch below the surface of a saline solution consisting of 5 parts by weight of salt in 95 parts by weight of distilled water that will be kept free of sediment by filtration or decantation. The switch assembly shall be installed in the chamber and carefully observed during its entire period of submersion and operated for 30 minutes at full rated current and voltage. The chamber shall then be evacuated to a pressure of six pounds below atmospheric so as to apply a minimum of six pounds per square inch (psi) internal pressure to all voids within the switch assembly. The test results per square inch (psi) internal pressure to all voids within the switch assembly. The test results obtained shall be compared with the data obtained in 4.5.7.3.1a. During this period the switch assembly shall be carefully observed for poor seals, as evidenced by leakage defined by bubbles escaping from the interior of the switch assembly when the chamber is evacuated as previously specified.
- c. The chamber shall then be pressurized to six pounds above atmospheric. Then the switch assembly shall again be operated for 30 minutes with the results recorded. The recorded results shall be compared to the data obtained from [4.5.7.3.1a](#).

4.5.7.3.2 Grade 2 switches.

- a. The switch assembly shall be installed in a test circuit equivalent to the assemblies' normal dry environment. The assembly shall then be operated both electrically and mechanically for a period of 30 minutes at full rated current and voltage with the results recorded.
- b. The switch assembly shall then be submerged in a container with the uppermost surface a minimum of one inch below the surface of a saline solution consisting of 5 parts by weight of salt in 95 parts by weight of distilled water that will be kept free of sediment by filtration or decantation, at room ambient temperature (77° + 15°F) for a period of one hour. The switch shall then be removed from the solution and allowed to drain for a period of five minutes in its normal operating position. It shall then be subjected to 15 hours of dry operation (three 5-hour periods) at full rated current and voltage and results obtained compared with pre-submergence data obtained under [4.5.7.3.2a](#).

4.5.7.4 Extreme temperature. To determine conformance to [3.5.4](#), the switch shall be connected to the applicable load specified in [4.5.2](#) and subjected to the tests specified in [4.5.7.4.1](#) and [4.5.7.4.2](#).

4.5.7.4.1 Low temperature operation. The switch shall be conditioned for 24 hours at -60°F ± 5°F. If the switch is type I or IV, arrangement 1 or 2, it shall be in normal position during conditioning. If the switch is type V, the switch shall be in "off" position during conditioning. If the switch is type V, the switch shall be in "off" position during conditioning. After conditioning and while in ambient air at the above temperature, the force specified in [3.5.4](#) shall be applied to the actuating area or handle of the switch. The switch shall then be operated for 1,000 cycles in accordance with the applicable requirements of [4.5.4](#) or [4.5.5](#).

4.5.7.4.2 High temperature operation. The switch shall be conditioned for 24 hours at 160°F ± 5°F. While still in ambient air at that temperature, the switch shall be operated for 1,000 cycles in accordance with the applicable requirements of [4.5.4](#) and [4.5.5](#).

4.5.8 Physical.

4.5.8.1 Shock. To determine conformance to [3.6.1](#), the switch shall be subjected to the shock test specified in [method 516, procedure I of MIL-STD-810](#).

4.5.8.2 Vibration. To determine conformance to [3.6.2](#), the switch shall be subjected to the vibration test specified in [method 514, procedure I of MIL-STD-810](#) as applicable for components installed on ground vehicles, except the maximum load shall be 4G.

4.5.8.3 Terminal strength. To determine conformance to [3.6.3](#), the switch shall be mounted in a suitable vise or fixture and subjected to the test specified in [4.5.8.3.1](#), [4.5.8.3.2](#), or [4.5.8.3.3](#), as applicable.

4.5.8.3.1 Switches with receptacle connectors. If the switch has receptacle connectors attached to the switch body, the mating connector and cable shall be attached. The force specified in [3.6.3](#) shall be applied to the cable in a direction perpendicular to the center axis of the connector pins.

4.5.8.3.2 Switches with leads. If the switch has leads permanently attached to the switch body, the force specified in [3.6.3](#) shall be applied to the terminal at the end of the lead in the direction in which the leads are attached to the switch body and in a direction perpendicular to same.

4.5.8.3.3 Switches with screw-on terminals. The terminal threads of switches with screw-on terminals shall be wiped as clean and dry as possible. (No thread lubricant shall be applied to the terminal at the end of the lead on each terminal post directly beneath the outermost terminal nut. A torque barely sufficient to cause each outermost nut to seat properly shall be applied to same.)

4.5.9 Materials and construction. Conformance to [3.3.2.1](#) and [3.3.3](#) and [3.3.5](#) through [3.3.7](#) 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.

4.5.10 Visual inspection. Switches shall be examined to verify that the design, constructions, marking and workmanship are in accordance with applicable requirements ([3.3](#) through [3.3.2](#), [3.3.4](#), [3.3.8](#) through [3.3.10](#), and [3.7](#) through [3.9](#)).

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. Switches covered by this specification are intended primarily for use on tactical military vehicles but may be found suited to other uses. Type I switches are used for horns (with or without relays), to close starting motor circuits when contactors or starting relays are employed, and as firing switches. Type II and type III switches are used for dimming headlamps, blackout lamps, and other vehicle lamps. Type IV switches are used to close starting motor circuits when contactors or starting relays are not employed. Type V switches are used for high-current circuits where quick, manual opening is desired.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of the specification.
- b. Type, arrangement, class, and grade of switch (see [1.2](#)).
- c. If required, the specific issue of individual documents referenced (see [2.2.1](#)).
- d. If terminal connectors other than as specified are required (see [3.3.8](#)).
- e. Packaging requirements (see [5.1](#)).

6.3 Definitions.

- a. Actuating force. Actuating force is the force applied to the actuator to operate the contacts (close contacts only).
- b. Movement differential. Movement differential is the distance or angle which the actuator travels from the operating position to the releasing position.
- c. Operating force (full travel). Operating force is the necessary force to apply to the contacts for proper operation.
- d. Overtravel. Overtravel is the distance in inches or degrees between the operating position and the extreme position to which the actuator may be moved.
- e. Pretravel. Pretravel is the distance or angle through which the actuator moves from free position to operating position.
- f. Releasing force or torque. The releasing force or torque is the value to which the force or torque on the actuator must be reduced to permit the contacts to return to the unoperated position after operation.

6.3.1 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).

6.4 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 QPL No. 13625 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 via email to vgp.chief@dla.mil or from the Defense Supply Center, Columbus, ATTN: DSCC-VQ, Post Office Box 3990, Columbus, OH 43216-5000. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.daps.dla.mil>.

6.5 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](#)).

6.6 Subject term (key word) listing.

Bright
Automotive
Low/High Beam

6.7 PIN. This specification requires a PIN that is as described in the appropriate reference to associated documents (see [3.1](#)).

6.8 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where modifications from this amendment 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:
Army - AT
DLA - CC

Preparing activity:
DLA - CC

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Review activities:
Army - CR4, MI

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/>.