

DETAIL SPECIFICATION
SWITCH, SENSITIVE: 30 VOLTS
DIRECT CURRENT MAXIMUM, WATERPROOF

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 a waterproof, single-pole, sensitive switch used for controlling electrical circuits up to 30 volts direct current in tactical military vehicles.

1.2 Classification. The switch is classified as follows (see 6.2 and 6.7):

- Type I - Single-throw
- Type II - Double-throw
- Class 1 - Normally open
- Class 2 - Normally closed

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 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 of documents in section 3, 4, or 5 of this specification, whether or not they are listed.

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 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/>.

2.2 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.

DEPARTMENT OF DEFENSE

SPECIFICATION

[MS39058](#) - Switch, Sensitive – 24 Volt DC, (Waterproof).

STANDARDS

[MIL-STD-130](#) - Identification Marking of U.S. Military Property.

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

Handbooks

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

[MIL-HDBK-1184](#) - Electrical Components for Automotive Vehicles; Waterproofness Tests.

(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 SOCIETY FOR TESTING AND MATERIAL (ASTM)

[ASTM-G21](#) - Materials To Fungi, Synthetic Polymeric, Determining Resistance of

(Application for copies can be found online at <http://www.astm.org/> or should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, P.O.Box C700, West Conshohocken, PA, 19428-2959).

INTERNATIONAL ORGANIZATION FOR STANDARDS (ISO)

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

NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCSL)

[NCSL-Z540.3](#) - Calibration of Measuring and Test Equipment, Requirements for

(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)

2.4 Order of precedence. 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 Qualification. Switches furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable Qualified Products List (QPL) at the time set for opening of bids (see 4.4 and 6.3).

3.2 Materials. Materials shall be as specified herein and in applicable specifications and standards. Insulating material shall conform to [MIL-HDBK-454](#), guideline 11 (see 4.6.1).

3.2.1 Dissimilar metals. Except where necessary to complete an electrical circuit, contact between dissimilar metals which would encourage galvanic action shall be avoided (see 4.6.1).

3.2.2 Recycled, virgin, and reclaimed 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 (see 6.4.2).

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 6.8)

3.3 Design and construction. Switch dimensions, construction and requirements shall be as specified in [MS39058](#) (see 4.6.1).

3.4 Physical requirements.

3.4.1 Shock. While carrying a rated resistive load current of 15 amperes, the switch shall not open or do., during shock testing as specified in [MIL-STD-202, method 213](#), test condition I. After the shock test, the switch shall meet the requirement of 3.5.2 (see 4.6.3.1).

3.4.2 Vibration. While carrying a rated resistive load current of 15 amperes, the switch shall not open or close during vibration testing as specified in 4.6.3.2. After the vibration test, the switch shall meet the requirements of 3.4.4, 3.5.2, and 3.5.4.

3.4.3 Lead connections. Lead connections to the switch body shall withstand a force of 110 Newton (N), applied in specified directions, without damage. Subsequently, the switch shall meet the requirements of 3.5.2 and 3.5.4 (see 4.6.3.3).

3.4.4 Physical characteristics. The switch shall actuate with 4.5 to 9.0 Newton (N) of force applied within 3 mm of center of switch button. Other physical characteristics shall be as follows (see 4.6.3.4):

- Release force - 1.7 newton, minimum.
- Release time - 0.25 second, maximum.
- Pretravel - 0.38 mm, minimum.
- Overtravel - 0.38 mm, minimum.
- Movement differential - 0.26 mm, maximum.

3.5 Electrical requirements.

3.5.1 Current rating. The current rating shall be 7.5 amperes lamp load, 7.5 amperes inductive load (L/R ratio 0.026), and 15 amperes resistive load (see 4.6.4.1).

3.5.2 Contact voltage drop. With switch contacts closed and a rated resistive load current of 15 amperes applied, the measured allowable voltage drop shall not exceed 150 millivolts, except as specified in 3.5.6 (see 4.6.4.2).

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3.5.3 Overload capacity. The switch shall withstand 100 make and break cycles while carrying a rated resistive load current of 22.5 amperes. Subsequently, the switch shall meet the requirements of [3.5.2](#) (see [4.6.4.3](#)).

3.5.4 Insulation resistance. The insulation resistance between open contacts of the switch shall be not less than 500 megohms (see [4.6.4.4](#)).

3.5.5 Open circuit resistance. The resistance between open contacts of the switch shall be not less than 1 megohm (see [4.6.4.5](#)).

3.5.6 Endurance. The switch shall withstand 25,000 make and break cycles while connected to either a rated inductive, load current or rated lamp load current of 7.5 amperes. Subsequent to cycling, the contact voltage drop shall not exceed 300 millivolts (see [4.6.4.5](#)).

3.6 Environmental requirements.

3.6.1 Corrosion. Subsequent to testing as specified in [4.6.5.1](#), the switching mechanism shall evidence no corrosion.

3.6.2 Fungus. The switch shall evidence no deterioration after testing as specified in [ASTM-G21](#) for a period of 90 days. The switch shall subsequently meet specified requirements (see [4.6.5.2](#)).

3.6.3 Waterproofness. The switch shall evidence no leakage when tested as specified in [MIL-HDBK-1184, method 100](#), and shall subsequently meet specified requirements (see [4.6.5.3](#)).

3.6.4 Extreme temperature. The switch shall operate for 1000 cycles (see [4.3.1](#)) throughout a temperature range of -54°C (-65°F) to 74°C (165°F) with a not greater than 0.25-second release time. The switch shall meet the requirements specified in [table I](#), for the temperature-tested samples, in the order shown (see [4.6.5.4](#)).

3.7 Identification marking. Identification marking shall be in accordance with [MIL-STD-130](#) (see [4.6.2](#)).

3.8 Workmanship. Workmanship shall be of a quality which will assure a product free of pinholes, flash, protrusions, or breaks in the rubber covering specified in [MS39058](#) or in lead wire insulation (see [4.6.2](#)).

4. VERIFICATION

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

- a. Qualification inspection (see [4.4](#)).
- b. Conformance inspections (see [4.5](#)).

4.2 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 supplier. The establishment and maintenance of a calibration system to control accuracy of the measuring and test equipment shall be in accordance with [NCSL-Z540.3](#), [ISO-10012-1](#) or equivalent system as approved by the qualifying activity.

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

- a. Air temperature $23 \pm 10^{\circ}\text{C}$.
- b. Barometric pressure $724 + 51, -76$ mmHg.
- c. Relative humidity $50 + 30$ percent.

4.3.1 Switch cycling frequency. Switch cycling frequency shall be 15 cycles per minute with $2.0 + 0.2$ seconds on and $2.0 + 0.2$ seconds off. The ends of the leads shall be sealed as necessary to prevent entry of moisture, salt or fungus through the ends.

4.4 Qualification inspection. A qualification sample of nine switches of each type and class to be qualified shall be furnished for qualification inspection. The samples shall be representative of switches 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, and shall consist of inspections specified in 4.6.1 and test as specified in table I in the order listed.

4.4.1 Failure. Failure of any switch to comply with the applicable requirements shall be cause for refusal to grant qualification.

4.4.2 Verification of qualification. Every 12 months, the manufacturer shall provide verification of qualification to the qualifying activity. Continuation is based on meeting the following requirements:

- a. Design of the switch has not been modified (every 12 months).
- b. Verification of group A lot acceptance (every 12 months) (see 4.5.2)
- c. Periodic group B inspection (every 36 months) (see 4.5.3).

4.5 Conformance Inspection. Inspection of product for delivery shall consist of group A inspection.

4.5.1 Inspection lot. An inspection lot shall consist of all category I and category II switches of the same specification sheet, of the same enclosure requirement, temperature characteristic and interface and dimensions, produced under essentially the same conditions and offered for inspection at one time.

4.5.2 Group A inspection. Group A inspection shall consist of the inspections specified in table II. The inspection may be performed in any order.

4.5.2.1 Sampling plan. Statistical sampling shall be in accordance with table III. For acceptance of the lot, there shall be zero occurrences of defects.

4.5.2.2 Rejected lots. If an inspection lot is rejected, the lot shall be 100 percent inspected for the defects noted. The contractor may correct the defects or remove all of the defective units from the lot. The lot shall then be sampled again in accordance with table III. For acceptance, there shall be zero occurrences of defects. If one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification. Such lots shall be separate from new lots and shall be clearly identified as reinspected lots.

4.5.3 Periodic inspection. Periodic inspection shall consist of group B. Except where the results of these inspections show noncompliance with the applicable requirements (see 4.5.3.1.3), delivery of products which have passed group A shall not be delayed pending the results of these periodic inspections.

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Table I. Qualification Test Sequence.

Sample number	Paragraph	Title
1 and 2	4.6.4.1	Current rating
	4.6.4.2	Contact voltage drop
	4.6.4.5	Open circuit resistance
	4.6.3.4	Physical characteristics
	4.6.5.4.1	Low temperature operation
	4.6.5.3.1	Waterproofness
	4.6.4.4	Insulation resistance
	4.6.5.4.2	High temperature operation
	4.6.3.4	Physical characteristics
	4.6.4.1	Current rating
	4.6.4.2	Contact voltage drop
	4.6.4.5	Open circuit resistance
	4.6.4.3	Overload capacity
	4.6.4.1	Current rating
4.6.4.2	Contact voltage drop	
4.6.5.1	Corrosion	
3 and 4	4.6.4.1	Current rating
	4.6.4.2	Contact voltage drop
	4.6.3.4	Physical characteristics
	4.6.3.3	Lead connections
	4.6.4.1	Current rating
	4.6.4.2	Contact voltage drop
	4.6.4.4	Insulation resistance
	4.6.3.1	Shock
	4.6.4.1	Current rating
	4.6.4.2	Contact voltage drop
	4.6.3.2	Vibration
	4.6.3.4	Physical characteristics
	4.6.4.1	Current rating
	4.6.4.2	Contact voltage drop
4.6.4.4	Insulation resistance	
5 and 6	4.6.4.1	Current rating
	4.6.4.2	Contact voltage drop
	4.6.3.4	Physical characteristics
	4.6.4.6	Endurance
	4.6.3.4	Physical characteristics
	4.6.4.1	Current rating
	4.6.4.2	Contact voltage drop
	4.6.4.4	Insulation resistance
7 and 8	4.6.4.1	Current rating
	4.6.4.2	Contact voltage drop
	4.6.3.4	Physical characteristics
	4.6.4.4	Insulation resistance
	4.6.5.2	Fungus
	4.6.3.4	Physical characteristics
	4.6.4.1	Current rating
	4.6.4.2	Contact voltage drop
4.6.4.4	Insulation resistance	
9	4.6.5.3.1	Waterproofness
	4.6.5.1	Corrosion

Table II. Group A Inspection.

Paragraph	Title
4.6.3.3	Lead connections
4.6.4.2	Contact voltage drop
4.6.3.4	Physical characteristics
4.6.4.2	Contact voltage drop
4.6.4.4	Insulation resistance
4.6.5.3.2	Waterproofness
4.6.4.2	Contact voltage drop
4.6.4.5	Open circuit resistance

TABLE III. Zero defect sampling plan.

Lot size	Minimum number of switches to be tested
1 - 12	All
13 - 150	13
151 - 280	20
281 - 500	29
501 - 1,200	34
1,201 - 3,200	42
3,201 - 10,000	50
10,001 - 35,000	60

4.5.3.1 Group B inspection. Group B inspection shall consist of the inspections specified in [table IV](#), in the order shown. When a manufacturer has switches qualified under various MS military standards or military specification sheets, the qualifying activity may authorize group B tests that do not require redundant testing on similar features. Group B inspection shall be performed on sample units selected from inspection lots which have passed group A inspection. A manufacturer's normal quality control tests, production tests, environmental tests and so forth may be used to fulfill all or part of group B inspection; however, all of group B inspection shall be completed as specified in [table IV](#). Data used may be accumulated within the previous 24 months.

4.5.3.1.1 Sampling plan. Group B inspections shall be completed in accordance with [table IV](#) within 36 months after the date of notification of qualification and within each subsequent 36 month period. The sample units shall be selected either from stock or a current production lot unless the Government considers it more practical to select a sample from current production. Switches selected from stock shall have been produced after the date of notification of qualification or subsequent to the date code of the previous group B inspection sample units. Group B inspection shall be performed on sample units produced using the same manufacturing facilities and processes as units normally offered for acquisition. When there has been no production of a particular type of switch for 36 months or more, sample units shall be selected from the next production lot presented for acceptance and for each subsequent 36 month period. When the specification sheet covers more than one part number, the part number subjected to group B inspection shall be the same part number specified for qualification; however, the group B inspection sample unit(s) need not be submitted to inspections not specified for qualification.

Table IV. Group B Inspection.

Paragraph	Title
4.6.4.2	Contact voltage drop
4.6.4.6	Endurance
4.6.3.4	Physical characteristics
4.6.4.2	Contact voltage drop
4.6.4.4	Insulation resistance
4.6.5.3.1	Waterproofness
4.6.4.4	Insulation resistance
4.6.4.2	Contact voltage drop
4.6.4.5	Open circuit resistance

4.5.3.1.2 Failures. If one or more sample units fails to pass group B inspection, the sample shall be considered to have failed.

4.5.3.1.3 Disposition of sample units. Sample units subjected to group B inspection shall not be delivered on the contract or order but shall be kept on hand until the next inspection period for submittal to the qualifying activity if so requested.

4.6 Methods of inspection.

4.6.1 Materials, design and construction. Conformance to [3.2](#), [3.2.1](#) and [3.3](#) shall be determined by inspection of contractor records providing proof or certification that 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 Defects. Conformance to [3.2](#), [3.3](#), [3.7](#), and [3.6](#) shall be determined by examination for the defects listed in [table III](#). Examination shall be visual, tactile, or by measurement with standard inspection equipment.

4.5.3.1.1 Sampling plan. Group B inspections shall be completed in accordance with [table IV](#) within 36 months after the date of notification of qualification and within each subsequent 36 month period. The sample units shall be selected either from stock or a current production lot unless the Government considers it more practical to select a sample from current production. Switches selected from stock shall have been produced after the date of notification of qualification or subsequent to the date code of the previous group B inspection sample units. Group B inspection shall be performed on sample units produced using the same manufacturing facilities and processes as units normally offered for acquisition. When there has been no production of a particular type of switch for 36 months or more, sample units shall be selected from the next production lot presented for acceptance and for each subsequent 36 month period. When the specification sheet covers more than one part number, the part number subjected to group B inspection shall be the same part number specified for qualification; however, the group B inspection sample unit(s) need not be submitted to inspections not specified for qualification.

4.5.3.1.1 Sampling plan. Group B inspections shall be completed in accordance with [table IV](#) within 36 months after the date of notification of qualification and within each subsequent 36 month period. The sample units shall be selected either from stock or a current production lot unless the Government considers it more practical to select a sample from current production. Switches selected from stock shall have been produced after the date of notification of qualification or subsequent to the date code of the previous group B inspection sample units. Group B inspection shall be performed on sample units produced using the same manufacturing facilities and processes as units normally offered for acquisition. When there has been no production of a particular type of switch for 36 months or more, sample units shall be selected from the next production lot presented for acceptance and for each subsequent 36 month period. When the specification sheet covers more than one part number, the part number subjected to group B inspection shall be the same part number specified for qualification; however, the group B inspection sample unit(s) need not be submitted to inspections not specified for qualification.

4.5.3.1.2 Failures. If one or more sample units fails to pass group B inspection, the sample shall be considered to have failed.

4.5.3.1.3 Disposition of sample units. Sample units subjected to group B inspection shall not be delivered on the contract or order but shall be kept on hand until the next inspection period for submittal to the qualifying activity if so requested.

4.6 Methods of inspection.

4.6.1 Materials, design and construction. Conformance to [3.2](#), [3.2.1](#) and [3.3](#) shall be determined by inspection of contractor records providing proof or certification that 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 Defects. Conformance to [3.2](#), [3.3](#), [3.7](#), and [3.6](#) shall be determined by examination for the defects listed in [table III](#). Examination shall be visual, tactile, or by measurement with standard inspection equipment.

4.6.3 Physical tests.

4.6.3.1 Shock. To determine conformance to [3.4.1](#), the switch shall be connected to a rated resistive load current of 15 amperes. An oscilloscope or other suitable device shall be used to detect momentary circuit closure or opening due to shock. The switch shall be mounted by means of a suitable strap around the switch body and subjected to the shock test specified in [MIL-STD-202, method 213](#), test condition I. An acceleration force, of 100 gravity units shall be applied in the direction of each of the three major axes of the switch when in closed position, and shall be repeated with the switch in open position.

4.6.3.2 Vibration. To determine conformance to [3.4.2](#), the switch shall be connected to a rated resistive load current of 15 amperes. An oscilloscope or other suitable device shall be used to detect momentary circuit closure or opening due to vibration. The switch shall be mounted by means of a suitable strap around the switch body and subjected to a simple harmonic motion having an amplitude of 0.76 mm (1.52 mm maximum total excursion), the frequency being varied uniformly between the approximate limits of 10 and 55 hertz (Hz). The entire frequency range, from 10 to 56 Hz and return to 10 Hz, shall be transverse in approximately 1 minute. This motion shall be applied for not less than 1 hour in the direction of each of the three major axes of the switch, with the switch in each open and closed position (a total of 6 hours of vibration).

4.6.3.3 Lead connections. To determine conformance to 3.4.3, the switch shall be held in a vise and a force of 110 N shall be applied to each connecting lead so that the tensile force is transmitted to the point where the lead is connected to the switch body. The force shall be applied both in the direction of the center axis of the switch and perpendicular to the center axis.

4.6.3.4 Physical characteristics. To determine conformance to 3.4.4, the switch shall be mounted as in intended operation. The force required to actuate it in the region specified in 3.4.4 shall be measured. Subsequently, the release force, release time, pretravel, overtravel, and movement differential shall be measured.

4.6.4 Electrical tests.

4.6.4.1 Current rating. To determine conformance to 3.5.1, the switch shall be mounted as in intended operation and the current rating measured under lamp load, inductive load, and resistive load.

4.6.4.2 Contact voltage drop (see 6-6). To determine conformance to 3.5.2 and to the contact voltage drop requirement of 3.5.2, the switch shall be subjected to the test specified in 4.6.4.2.1 or 4.6.4.2.2, as applicable. The switch shall be subjected to the nondestructive test specified in 4.6.4.2.1 if the switch is subsequently to be subjected to any of the tests specified in 4.6.5.1 through 4.6.5.3 (see table I and 4.5) or when the switch is being subjected to acceptance tests (see 4.5.3). Otherwise the switch shall be subjected to the destructive test specified in 4.6.4.2.2 (See table I and 4.5).

4.6.4.2.1 Nondestructive test. The switch shall be connected to a rated resistive load current of 15 amperes. The voltage drop shall be measured between the ends of each appropriate pair of leads with the contacts in the corresponding closed position. The contact voltage drop shall be estimated by subtracting the product of 5 millivolts per inch times the total length in cm of the two conductor leads, from the voltmeter reading in millivolts.

4.6.4.2.2 Destructive test. The switch shall be connected to a rated resistive load current of 15 amperes. A point shall be located on each lead 10 mm ± 5 mm from the body of the switch. The leads shall be punctured as necessary and the voltage drop measured between each appropriate pair of points defined above, with the contacts in the corresponding closed position.

4.6.4.3 Overload capacity. To determine conformance to 3.5.3, the switch shall be subjected to 100 make and break cycles while being subjected to a rated resistive load current of 22.5 amperes.

4.6.4.4 Insulation resistance. To determine conformance to 3.5.4, the insulation resistance shall be measured between the ends of each appropriate pair of leads, with the contacts in the corresponding open position, in accordance with MIL-STD-202, method 302, test condition C.

4.6.4.5 Open circuit resistance. To determine conformance to 3.5.5, the open circuit resistance shall be measured between each appropriate pair of leads, with the contacts in the corresponding open position, using a suitable ohmmeter.

4.6.4.6 Endurance. To determine conformance to 3.5.6, one-half of the switches to be tested shall be connected to a rated inductive load current of 7.5 amperes. The remainder of the switches to be tested shall be connected to a rated lamp load current of 7.5 amperes. Each loaded switch shall be operated for 25,000 make and break cycles. During the test, each switch shall be periodically observed for evidence of malfunction. Subsequently, the contact voltage drop shall be measured.

4.6.5 Environmental tests.

4.6.5.1 Corrosion. Subsequent to testing as specified in [4.6.5.3.1](#), the switch shall be opened and the spring, contact point, and soldered connections shall be visually examined to determine conformance to [3.6.1](#).

4.6.5.2 Fungus. To determine conformance to [3.6.2](#), the switch shall be subjected to the test specified in [ASTM-G21](#), class 1, method A, except that examination shall be made after 90 days.

4.6.5.3 Waterproofness.

4.6.5.3.1 Qualification and control tests. To determine conformance to [3.6.3](#), the switch shall be subjected to the test specified in [MIL-HDBK-1184, method 100](#), procedure 1, except that the switch shall not be operated while submerged.

4.6.5.3.2 Acceptance test. To determine conformance to [3.6.3](#), the switch shall be subjected to the test specified in [MIL-HDBK-1184, method 100](#), procedure 5.

4.6.5.4 Extreme temperature. To determine conformance to [3.6.4](#), the switch shall be subjected to the tests specified in [4.6.5.4.1](#) and [4.6.5.4.2](#).

4.6.5.4.1 Low temperature operation. The switch shall be conditioned for 24 hours at $51 \pm 3^{\circ}\text{C}$. While still in ambient air at that temperature, the switch shall be operated for 1000 cycles (see [4.3.1](#)) while connected to a rated resistive, load current of 15 amperes and the release time measured.

4.6.5.4.2 High temperature operation. The switch shall be conditioned for 24 hours at $74^{\circ}\text{C} \pm 3^{\circ}\text{C}$. While still in ambient air at that temperature, the switch shall be operated for 1000 cycles (see [4.3.1](#)) while connected to a rated resistive load current of 15 amperes and the release time measured.

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 to be used as gun-firing switches in combat vehicles.

6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type and class of switch (see 1.2).
- c. Item name and part number (see 3.3).
- d. The specific issue of individual documents referenced (see 2.1).
- e. If responsibility for inspection will be other than as specified (see 4.1).
- f. If inspection conditions will be other than as specified (see 4.3).
- g. Selection of applicable level and packaging requirements (see 5.1).

6.3 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. 3950 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 via email to vgp.chief@dla.mil or from the DLA Land and Maritime, Attn: VQP, 3990 East Broad Street, Columbus, OH 43213-1199. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.daps.dla.mil>.

6.4 Definitions.

6.4.1 Recovered materials. "Recovered materials" means materials that have been collected or recovered from solid waste (see 6.4.2).

6.4.2 Solid waste. "Solid waste" means (a) any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility; and (b) other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining and agricultural operations, and from community activities. It does not include solid or dissolved material in domestic sewage, or solid or dissolved material in irrigation return flows, or industrial discharges which are point sources subject to permits under section 402 of the Clean Water Act, (33 U.S.C. 1342 et seq.), or source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) (Source: Federal Acquisition Regulations, section 23.402).

6.5 Contact voltage drop tests. Two contact voltage drop tests are specified (see 4.6.4.2) because (1) a test which does not destroy the rubber meal of the switch is necessary in order to assure meaningful results from subsequent waterproofness, corrosion, or fungus tests, while (2) a test in which the rubber seal of the leads is destroyed is necessary in order to determine the actual voltage drop across the switch contacts.

6.6 Open circuit resistance test. The purpose of this other test (see 4.6.4.5) is to determine if the switch contacts are open without subjecting the switch to an excessive number of applications of high voltage.

6.7 Grades. Previous revisions of this specification carried classifications of grade A (waterproof) and grade B (nonwaterproof). Since all switches are now waterproof, this classification was dropped.

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 Subject term (key word) listing.

- Contact voltage drop
- Current rating
- Endurance
- Fungus
- High temperature operation
- Insulation resistance
- Lead connections
- Low temperature operation
- Open circuit resistance
- Overload capacity
- Recovered material
- Shock
- Vibration
- Waterproofness

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 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:
Army - AT
DLA - CC

Preparing activity:
DLA - CC

(Project 5930-2011-001)

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/>.