MIL-S-13625D(AT)
15 July 1987
SUPERSEDING
MIL-S-13625C(AT)
17 June 1970

MILITARY SPECIFICATION

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

This specification is approved for use within the US Army Tank-Automotive Command, Department of the Army, and is available 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 shall 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.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: US Army Tank-Automotive Command, ATTN: AMSTA-GDS, Warren, MI 48397-5000, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter.

AMSC N/A FSC 5930

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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).

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 Government documents.

* 2.1.1 Specification and standards. The following specification and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

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SPECIFICATION
MILITARY

MIL-C-13486	- Cable; Special Purpose, Electrical: Low-Tension, Heavy Duty Single-Conductor and Multiconductor.

STANDARDS
FEDERAL

FED-STD-H28	- Screw-Thread Standards for Federal Services.

MILITARY

MIL-STD-105	- Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-130	- Identification Marking of US Military Property.
MIL-STD-193	- Painting Procedures and Marking for Vehicles, Construction Equipment and Material Handling Equipment.
MIL-STD-202	- Test Methods for Electronic and Electrical Components Parts.
MIL-STD-454	- Standard General Requirements for Electronic Equipment.
MIL-STD-810	- Environmental Test Methods and Engineering Guidelines.
MIL-STD-1184	- Electrical Components for Automotive Vehicles; Waterproofness Tests.
MS27148	- Contact; Pin, Electrical Connector: No. 12, 14 and 16 AWG.
MS27199	- Switch, Push-SPST, Heavy Duty, 24 Volt DC.
MS27200	- Switch, Pull-SPST, Latch Disconnect, 24 Volt DC.
MS53000	- Switch, Beam Selecting, Headlight-SPDT, No Off, 28 Volt DC.
MS50001	- Switch, Beam Selecting, Headlight-DPDT, No Off, 28 Volt DC.

* 2.1.2 Other Government drawings. The following Government drawings form a part of this specification to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

DRAWINGS
ARMY

8328134	- Switch Assembly.
8389470	- Switch Assembly Push-Button.
8674655	- Switch, Gunner's Firing.

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10921898	- Switch Assembly, Horn.
11614139	- Switch Assembly, Push.
11640178	- Switch, Snap Action, Push Button.

(Copies of specifications, standards, handbooks, drawings, publications, and other Government documents required by the contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

* 2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The switches furnished under this specification shall be products which are qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.2 and 6.4).

3.2 Design and construction. The switch shall be constructed to the form and dimensions specified on the applicable military standards or drawings (see 2.1 and 4.5.10).

3.2.1 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 appplicable document (see 4.5.10).

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

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

3.2.2.2 Dissimilar metals. Except where necessary to complete an electrical circuit, contact between dissimilar metals, as defined in requirement 16 of MIL-STD-454, 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).

3.2.3 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).

3.2.4 Threaded parts. All screw threads shall conform to FED-STD-H28 (see 4.5.10).

3.2.5 Springs. Springs shall not be used to transmit current (see 4.5.9).

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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 4.5.9).

3.2.7 Soldering. Soldering shall conform to requirement 5 of MIL-STD-454 (see 4.5.10).

3.2.8 Terminals. Unless otherwise specified (see 6.2), tip dimensions of round terminals for snap-on connectors shall conform to MS27148 (see 4.5.10).

3.2.9 Cable. Unless otherwise specified on the applicable military standard or drawing, the electrical lead cable shall conform to MIL-C-13486 (see 4.5.10).

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

3.3 Performance.

3.3.1 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 3.3.2.

3.3.2 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.

3.3.3 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 3.3.6 for endurance test specimens.

3.3.4 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 3.3.3.

3.3.5 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.

3.3.6 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 3.3.2 and 3.3.5.

3.4 Environmental.

3.4.1 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 3.3.2, 3.3.3, and 3.3.5.

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3.4.2 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 3.3.2, 3.3.3, and 3.3.5.

* 3.4.3 Waterproofness. When tested as specified in 4.5.7.3, grade 1 switches shall meet the requirements for type II, class 2 components of MIL-STD-1184 and grade 2 switches shall meet the requirements for type II, class 3 components of MIL-STD-1184.

3.4.4 Extreme temperature. When tested as specified in 4.5.7.4, the switch shall operate in a temperature range of minus 65°F through plus 165°F. While at minus 60 ± 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 3.3.2 and 3.3.3.

3.5 Physical.

3.5.1 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.

3.5.2 Vibration. While 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 3.3.2 and 3.3.3.

3.5.3 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 permanantly 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 1/16 inch or any rotation of more than 15° after the test. Each switch, regardless of terminal construction, shall subsequently meet the requirements of 3.3.3.

3.6 Finish. Cleaning, pretreatment, priming, and painting shall conform to MIL-STD-193 (see 4.5.10).

3.7 Marking.

3.7.1 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
Manufacturers Name or Identification
Date of Manufacture (month, year; e.g. June 85)
US

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3.8 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. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order (see 6.2), the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform or witness any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

* 4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply wih all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 Qualification testing. 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 testing shall be conducted by the Government at a place designated by the Government and shall consist of examination for the defects specified in 4.3.2.2 and testing as specified in table II in the order listed.

TABLE II. Order of qualification testing.

Sample no.	Paragraph no.	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
	4.5.6.5	High voltage

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TABLE II. Order of qualification testing - Continued.

Sample no.	Paragraph no.	Test sequence
3 and 4	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
	4.5.6.3	Contact voltage drop
	4.5.6.2	Operating force
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
	4.5.6.3	Contact voltage drop
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

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 Quality conformance inspection.

4.3.1 Sampling.

4.3.1.1 Lot formation. A lot shall consist of all switches of one part number, from an identifiable production period, from one manufacturer, submitted at one time for acceptance.

4.3.1.2 Sampling for examination. Samples for quality conformance examination shall be selected in accordance with general inspection level II of MIL-STD-105.

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4.3.1.3 Sampling for testing. A representative sample shall be selected in accordance with level S-3 of MIL-STD-105 from each lot that has passed the inspection specified in 4.3.2.2.

4.3.2 Examination.

4.3.2.1 Acceptable quality level. Each switch selected in accordance with 4.3.1.2 shall be examined for conformance to the following acceptable quality levels (AQL) on the basis of percent defective:

Classification	AQL
Major	1.0
Minor	2.5

4.3.2.2 Classification of defects. For examination purposes, defects shall be classified as listed in table III.

TABLE III. Classification of defects.

Category	Defect	Method of examination
Critical	None	
Major	AQL 1.0% Defective	
101	Dimensions affecting interchangeability, not within tolerance (see 3.2).	SIE 1/
102	Materials not as specified (see 3.2.2).	Visual
103	Threads not as specified (see 3.2.4).	SIE
104	Terminals not as specified (see 3.2.8).	Visual
105	Cables not as specified (see 3.2.9).	Visual
106	Faulty workmanship (see 3.8).	Visual
Minor	AQL 2.5% Defective	
201	Dimensions not affecting interchangeability, not within tolerance (see 3.2).	SIE
202	Excessive weight (see 3.2.10).	SIE
203	Improper finish (see 3.6).	Visual
204	Improper marking (see 3.7).	Visual

1/ SIE = Standard Inspection Equipment.

4.3.3 Testing.

4.3.3.1 Quality conformance test. Samples selected in accordance with 4.3.1.3 shall be subjected to the tests specified in table IV using an AQL of 6.5 on the basis of percent defective.

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TABLE IV. Order of quality conformance testing.

Paragraph no.	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. Switches shall be selected at the rate of 2 of each 500 produced or fraction thereof, provided that not less than 2 nor more than 6 units shall be selected in any 90-day period. The control test sample shall be identified as to production period and after having been examined for the defects specified in 4.3.2.2, 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
1 and 2	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 ± 15°F and tests shall be conducted at an ambient of 77 ± 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 minus 65 to plus 165°F. Air movement in the high temperature

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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 Calibration of test equipment. Unless specified herein, test equipment accuracy shall be such as to permit measurement of 10 percent of product or test specification tolerance. Calibration of test equipment shall be conducted at intervals sufficient to establish required accuracy. Records of calibration shall be made available to the Government. The inspector may refuse to conduct an inspection where accuracy of test equipment has not been established to the satisfaction of the Government. Required measuring instrument tolerances are as listed in table VI.

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 mechanisms 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).

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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 3.3.1, 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 3.3.2, 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 actuates (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 3.3.3, 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 4.5.5.1.2.

4.5.6.3.1 Test procedures. 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 3.3.4, 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.

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4.5.6.5 High voltage. To determine conformance to 3.3.5, 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 3.3.6, 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 3.4.1, 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 luke warm 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 3.4.2, 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 3.4.3, grade 1 switches shall be subjected to the waterproofness test for type II, class 2 components and grade 2 switches shall be subjected to the test for type II, class 3 components as specified in MIL-STD-1184.

4.5.7.4 Extreme temperature. To determine conformance to 3.4.4, 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 minus 60 ± 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. After conditioning and while in ambient air at the above temperature, the force specified in 3.4.4 shall applied to the actuating area or handle of the switch. The switch shall then be operated for 1000 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 ± 5°F. While still in ambient air at that temperature, the switch shall be operated for 1000 cycles in accordance with the applicable requirements of 4.5.4 or 4.5.5.

4.5.8 Physical.

4.5.8.1 Shock. To determine conformance to 3.5.1, the switch shall be subjected to the shock test specified in method 516, procedure I of MIL-STD-810.

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4.5.8.2 Vibration. To determine conformance to 3.5.2, 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 3.5.3, 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 3.5.3 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 3.5.3 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 3.2.2.1 through 3.2.3 and 3.2.5 through 3.2.7 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 Defects. Conformance to 3.2 through 3.2.2, 3.2.4, 3.2.8 through 3.2.10, and 3.6 through 3.8 shall be determined by examination for the defects listed in table III. Examination shall be visual, tactile, or by measurement with standard inspection equipment.

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, packing, and marking. Preservation, packaging, packing, and marking for the desired level shall be in accordance with the applicable packaging standard or packaging data sheet specified by the contracting authority (see 6.2).

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6. NOTES

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 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 Ordering data. Procurement documents should specify the following:

a. Title, number, and date of this specification.
b. Type, arrangement, class, and grade of switch (see 1.2).
c. Applicable military standard or drawing (see 3.2).
d. If terminal connectors other than as specified are required (see 3.2.8).
e. If responsibility for inspection shall be other than as specified (see 4.1).
f. Selection of applicable level and packaging standard or packaging data sheet (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.

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the contractors is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the

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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. The activity responsible for the Qualified Products List is U. S. Army Tank-Automotive Command, Warren, Michigan 48397-5000 and information pertaining to qualification of products may be obtained from that activity.

* 6.5 Subject term (key word) listing.

Switches, pull
Switches, push
Switches, beam selecting, headlight

* 6.6 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue 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 and relationship to the last previous issue.

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5. PROBLEM AREAS

a. Paragraph Number and Wording

b. Recommended Wording

c. Reason/Rationale for Recommendation

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